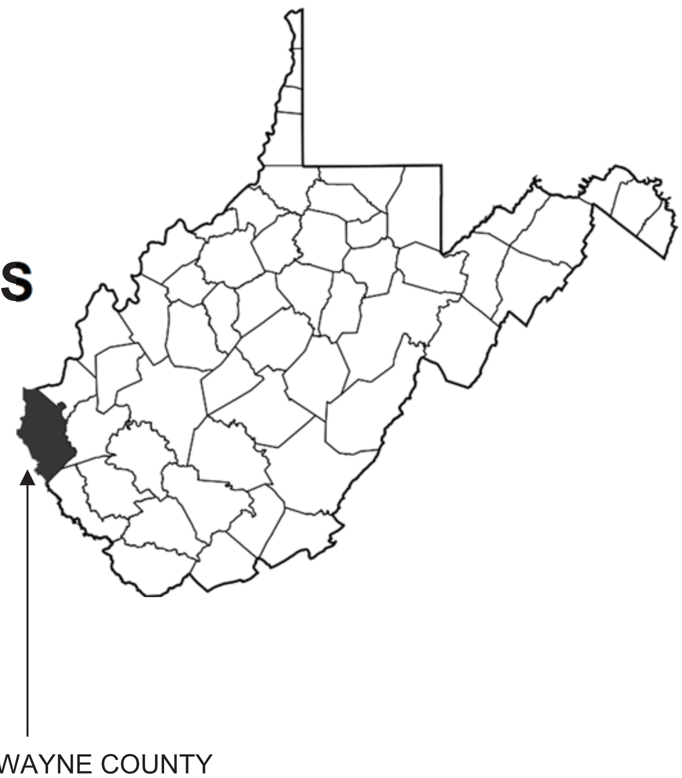
FLOOD INSURANCE STUDY

WAYNE COUNTY, WEST VIRGINIA
AND INCORPORATED AREAS

COMMUNITY NAME	COMMUNITY NUMBER
CEREDO, TOWN OF	540232
FORT GAY, TOWN OF	540202
KENOVA, CITY OF	540221
WAYNE COUNTY, UNINCORPORATED AREAS	540200
WAYNE, TOWN OF	540231



Please note: this Revised Preliminary FIS report incorporates updates for the Tug Fork and Ponding Areas; the unrevised FIS report components will be included in the final published FIS report.

PRELIMINARY:
MARCH 20, 2015

REVISED DATE:

Federal Emergency Management Agency

Flood Insurance Study Number
54099CV000B

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study (FIS) may not contain all data available within the Community Map Repository. Please contact the Community Map Repository for any additional data.

Part or all of this FIS may be revised and republished at any time. In addition, part of this FIS may be revised by the Letter of Map Revision process, which does not involve republication or redistribution of the FIS. It is, therefore, the responsibility of the user to consult with community officials and to check the community repository to obtain the most current FIS components.

Initial countywide FIS Effective Date: January 2, 2013

Revised FIS Dates:

Please note: this Revised Preliminary FIS report incorporates updates for the Tug Fork and Ponding Areas; the unrevised FIS report components will be included in the final published FIS report.

TABLE OF CONTENTS

TABLE OF CONTENTS – continued

FLOOD INSURANCE STUDY
WAYNE COUNTY, WEST VIRGINIA AND INCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study (FIS) revises and updates previous FISs/Flood Insurance Rate Maps (FIRMs) for the geographic area of Wayne County, West Virginia, including: Towns of Ceredo, Fort Gay, and Wayne; the City of Kenova; and all unincorporated areas of Wayne County (hereinafter referred to collectively as Wayne County). The City of Huntington is located in more than one county, but is included in its entirety in the Cabell County FIS.

This FIS aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promoted sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program (NFIP) are set forth in the Code of Federal Regulations at 44 CFR, 60.3, as amended.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally—supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the floodplain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3. In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The sources of authority for this FIS are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The January 2, 2013, FIS was prepared to incorporate the incorporated communities within Wayne County in a countywide format. Information on the authority and acknowledgments for each jurisdiction included in this FIS, as compiled from their previously printed FIS reports, is shown below.

Ceredo, Town of:	The hydrologic and hydraulic analyses for the Ohio River and Jordans Branch were prepared by the Huntington District of the U.S. Army Corps of Engineers (USACE) for the Federal Emergency Agency (FEMA), under Inter-Agency Agreement No. EMW-87-E-2509, Project Order No. 3. That work was completed in August 1987 (Reference 1). The hydrologic and hydraulic analyses for Twelvepole Creek were prepared by the USACE during the preparation of the 1987 FIS for the unincorporated areas of Wayne County. The

work for that study was completed in January 1986 (Reference 2).

Fort Gay, Town of: The hydrologic and hydraulic analyses for this study were prepared by Burgess & Niple, Limited, for the Federal Insurance Administration, under Contract No. H-4018. This work, which was completed in July 1977, covered all significant flooding sources affecting the Town of Fort Gay (Reference 3).

Kenova, City of: The hydrologic and hydraulic analyses for the Ohio River were prepared by the Huntington District of the USACE for FEMA, under Inter-Agency Agreement No. EMW-87-E-2509, Project Order No. 3. That work was completed in August 1987 (Reference 4).

The hydrologic and hydraulic analyses for the Big Sandy River were prepared by the USACE during the preparation of the 1987 FIS for the unincorporated areas of Wayne County. The work for that study was completed in January 1986 (Reference 2).

Wayne County (Unincorporated Areas): The hydrologic and hydraulic analyses for this study were prepared by the USACE, Huntington District, for FEMA, under Inter-Agency Agreement No. EMW-84-E-1506, Project Order No. 1, Amendment No. 25. This work was completed in January 1986. (Reference 2).

Wayne, Town of: The hydrologic and hydraulic analyses for this study were prepared by the USACE, Huntington District, for FEMA, during the preparation of the 1987 FIS for the unincorporated areas of Wayne County. The work for that study was completed in January 1986 (Reference 5).

For the January 2, 2013, study, the conversion to the Digital Flood Insurance Rate Map (DFIRM) is based upon updated orthophotography and involved the conversion to the DFIRM format, the redelineation of select floodplain and floodway areas based upon updated topography, and the transition from the National Geodetic Vertical Datum of 1929 (NGVD 29) to the North American Vertical Datum of 1988 (NAVD 88) and was prepared by the USACE, Huntington District, for FEMA, under Inter-Agency Agreement No. HSFE03-04-X-0015. This work was completed in December 2010 (Reference 6).

For the January 2, 2013, study, the Big Sandy hydraulic analysis was updated by Stantec Consulting Services, Inc. (formerly FMSM, Inc.) in October 2008 and submitted to FEMA as part of a Letter of Map Change (LOMC) submittal which resulted in a Physical Map Revision (PMR) letter (Reference 7).

An automated approximate study was performed on the previously unstudied upstream reaches of Krouts Creek bounded downstream by a CSX Railroad stream crossing and upstream by the property previously used as a golf course. This work was performed by the USACE Flood Plain Management Services (FPMS) program and was completed in January 2010 (Reference 8).

Also for the January 2, 2013, study, new model-backed approximate studies were performed throughout Wayne County, effectively replacing all previously effective Zone A floodplains. This work was prepared by AMEC Earth and Environmental under an Indefinite Delivery / Indefinite Quantity (IDIQ) Agreement with FEMA, and was completed in May 2010 (Reference 9). For this latest revision, the model-backed Zone A cross sections with water surface elevations were added to the GIS Database.

For this revision, new detailed study of the Tug Fork and the backwater reaches of its tributaries was performed throughout Wayne County, effectively replacing all previously effective floodplains. This work was prepared in coordination between the Kentucky Department of Water (KDOW), FEMA Regions III and IV, and Risk Assessment, Mapping, and Planning Partners (RAMPP), under CTP Agreement Nos. EMA-2010-CA-5082 and EMA-2011-CA-5145. This work was completed in April 2014 (Reference 10).

For this revision, new detailed study of 4 ponding areas was performed for the Town of Ceredo and the City of Kenova. This work was completed in April 2013 (Reference 11).

For this revision, base map information shown on the FIRM panels was created by the West Virginia Statewide Addressing and Mapping Board (SAMB). Imagery was captured at a scale of 1" = 2,400' in the Spring of 2003 for the purpose of producing natural color digital orthophotos at a 2-foot pixel resolution. The projection used in the preparation of this map is Universal Transverse Mercator (UTM) zone 17, North American Datum of 1983 (NAD 83), GRS80 spheroid (Reference 12).

1.3 Coordination

Consultation Coordination Officer’s (CCO) meetings have been held for each jurisdiction in this FIS. An initial CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to explain the nature and purpose of a FIS and to identify the steams to be studied by detailed methods. A final CCO meeting is held typically with representatives of FEMA, the community, and the study contractor to review the results of the study.

The dates of the initial and final CCO meetings held for Wayne County are shown in Table 1, “Initial and Final CCO Meetings.”

TABLE 1 – INITIAL AND FINAL CCO MEETINGS

Community	Initial CCO Date	Intermediate CCO Date	Final CCO Date
Ceredo, Town of	April 15, 1987*	-	June 2, 1988
Kenova, City of	April 17, 1987*	-	June 2, 1988
Fort Gay, Town of	April 6, 1976	July 15, 1977	February 27, 1978
Wayne County (Unincorporated Areas)	February 15, 1984	July 24, 1984*	October 29, 1986
Wayne, Town of	July 21, 1986*	-	October 29, 1986

*Date community notified by FEMA of the initiation of a FIS

For the January 2, 2013, study, an initial CCO meeting was held on June 15, 2004, with representatives from FEMA, Wayne County, the USACE (the study contractor), and the State of West Virginia to discuss the areas to be redelineated, the DFIRM format and the conversion to the NAVD 88 datum. A final CCO meeting was held on September 27, 2011, with representatives of FEMA, the study contractor, and representatives from the communities.

For this revision, a Discovery meeting was held on June 13, 2012, with representatives of FEMA, the study contractor, the Kentucky Division of Water, the U.S. Army Corps of Engineers (USACE) Huntington District, the U.S. Senate, the West Virginia Office of Emergency Services, the West Virginia Department of Transportation, the Virginia Department of Conservation, and representatives from the communities. A final CCO meeting was held on _______, with representatives of FEMA, the study contractor, the Kentucky Division of Water, the U.S. Army Corps of Engineers (USACE) Huntington District, and representatives from the communities. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This FIS covers the geographic area of Wayne County, West Virginia.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction. For this revision, the Tug Fork in the Tug Fork watershed (HUC-8: 05070201) and ponding areas within the Town of Ceredo and the City of Kenova was studied. All or portions of the flooding sources listed in Table 2, "Flooding Sources Studied by Detailed Methods," were studied by detailed methods in this revision and/or in previously printed FIS reports. Limits of detailed study are indicated on the Flood Profiles (Exhibit 1) and on the FIRM (Exhibit 2).

TABLE 2 – FLOODING SOURCES STUDIED BY DETAILED METHODS

STREAM NAME	STUDY REACH
Big Sandy River………….	for its entire length within the county
Buffalo Creek…………….	from its confluence with Twelvepole Creek to approximately 0.44 mile upstream of Buffalo Creek Road
Jennie Creek……………...	for its entire length within the county
Jordans Branch…………...	from its confluence with Twelvepole Creek to the Town of Ceredo corporate limits
Krouts Creek …………….	from the southerly City of Huntington limits to the railroad alignment
Marrowbone Creek……….	for its entire length within the county
Mill Creek………………..	from its confluence with the Tug Fork to U. S. Route 52
Ohio River………………..	for its entire length within the Town of Ceredo and the City of Kenova
Ponding Area 1…………...	from Porter Avenue, along Sycamore Street, to 13th Street in the City of Kenova
Ponding Area 2…………...	from the intersection of the railroad and 21st Street to the Ceredo-Kenova Levee System to the north and west, in the City of Kenova
Ponding Area 3…………...	from the intersection of the railroad and 21st Street (to the west), from the intersection of the railroad and 12th Street (to the east), and extending from these points to the Ceredo-Kenova Levee System to the north, in the City of Kenova
Ponding Area 3…………...	from the intersection of the railroad and 21st Street (to the west), from the intersection of the railroad and 12th Street (to the east), and extending from these points to the Ceredo-Kenova Levee System to the north, in the City of Kenova
Ponding Area 4…………...	from the intersection of the railroad and 12th Street (to the west), from the intersection of the railroad and 6th Street (to the east), and extending from these points to the Ceredo-Kenova Levee System to the north, in the City of Kenova; and from the intersection of C Street and 6th Street (to the west), from the intersection of C Street and the railroad (to the east), and extending from these points to the Ceredo-Kenova Levee System to the north, in the Town of Ceredo
Tug Fork………..………...	for its entire length within the county
Twelvepole Creek………...	for its entire length within the county
West Twelvepole Creek….	for its entire length within the county

No other new hydrologic or hydraulic analysis was performed for the January 2, 2013, study. The existing floodplain and floodway on the Ohio River, the Big Sandy River (portion not affected by the Stantec Consulting Services, Inc. study described above), Mill Creek and Jennie Creek were redelineated based upon existing updated topographic surveys, including the Ohio River 5' contours (1998), the Big Sandy River 5' contours (2002), and Mill Creek and Jennie Creek 5' contours (1994) (References 13, 14, and 15).

The flooding sources and their tributaries studied by approximate methods are listed in Table 3, "Flooding Sources Studied by Approximate Methods." Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Wayne County.

TABLE 3 – FLOODING SOURCES STUDIED BY APPROXIMATE METHODS

Arkansas Branch	Kiah Creek
Balangee Branch	Krouts Creek
Battern Fork	Laurel Creek
Beech Fork	Left Fork
Beechy Branch	Left Fork Camp Creek
Big Branch	Left Fork Hurricane Branch
Big Creek	Left Fork Hurricane Creek
Big Laurel Creek	Left Fork Lick Creek
Big Sandy River Tributary 1	Left Fork Lynn Creek
Billy Branch	Left Fork Mill Creek
Black Fork	Left Fork Millers Fork
Bloss Branch	Left Fork Rich Creek
Blue Lick Branch	Left Fork Wilson Creek
Blue Water Branch	Lick Creek
Bobs Branch	Little Hurricane Creek
Brush Creek	Little Laurel Creek
Buffalo Creek	Little Lynn Creek
Bull Creek	Little Milam Creek
Camp Creek	Long Branch
Camp Creek Right Fork	Lower Right Fork
Cove Creek	Lost Creek
Cove Spruce Branch	Lynn Creek
Cranes Branch	Mary Davis Branch
Davis Branch	Maynard Branch
Deephole Branch	Mays Branch
Dock Creek	Medley Fork
Drag Creek	McComas Branch
Drift Branch	Miller Creek
East Fork	Middle Fork Wilson Creek
East Fork Twelvepole Creek	Milam Creek
East Lynn Lake	Mill Creek
Elijah Creek	Miller Creek
Farley Fork	Millers Fork
Fisher Bowen Branch	Missouri Branch
Flat Branch	Milt Adkins Fork
Fraley Fork	Moses Fork
Garrett Creek	Mudlick Fork
Geiger Branch	Nations Branch
Grassy Lick	Newcomb Creek
Gragston Creek	Old Fork
Grassy Branch	Onemile Creek
Greenbrier Creek	Open Fork
Haneys Branch	Paddle Creek Patrick Creek
Honeytrace Fork	Plymale Branch
Horse Creek	Price Creek
Hurricane Branch	Powdermill Branch
Hurricane Creek	Price Creek
Joels Branch	Queens Creek
Jonnies Branch	Queenscamp Branch

TABLE 3 – FLOODING SOURCES STUDIED BY APPROXIMATE METHODS – continued

Redhead Branch	Sweet Run
Rich Creek	Sweetwater Branch
Right Fork Right Fork Beech Fork	Sycamore Branch
Right Fork Bull Creek	Tabor Creek
Right Fork Camp Creek	Tiger Fork
Right Fork Garrett Creek	Toms Creek
Right Fork Lick Creek	Trace Branch
Right Fork Little Lynn Creek	Trace Fork
Right Fork Lost Creek	Trough Fork
Right Fork Lynn Creek	Turkey Creek
Right Fork Mill Creek	Turkeycamp Branch
Right Fork Moses Creek	Twomile Creek
Right Fork Rich Creek	Vinson Branch
Rich Creek	Walker Branch
Rocklick Branch	West Fork Twelvepole Creek
Rollem Fork	Whites Creek
Rush Branch	Wiley Branch
Selbee Branch	Wilson Creek
Silk Fork	White Oak Creek
Silver Creek	Woleft Fork Creek
Spruce Fork	Woleft Forkpen Branch
Stonecoal Creek	Wolf Creek

Approximate analyses were used to study those areas having a low developmental potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and Wayne County. All approximate studies were revised in the January 2, 2013, study, throughout Wayne County, effectively replacing all previously effective Zone A floodplains (Reference 16).

LOMR Case Number 03-03-001P, issued for Wayne County, became effective on January 17, 2003, and incorporated updated topographic information and new hydraulic analyses to revise the floodplain and floodway information along Twelvepole Creek, from a point approximately 0.5 mile downstream of Lynn Creek Road to a point approximately 0.3 mile downstream of Lynn Creek Road. The results of this LOMR were incorporated into the January 2, 2013, study (Reference 17).

LOMR Case Number 09-03-0039P, issued for the City of Kenova and Wayne County, became effective on January 2, 2013, and incorporated updated floodplain and floodway information for the Big Sandy River, based upon a new hydraulic analysis, updated topography, and the previously effective Wayne County hydrologic data. The study area for the Big Sandy River extended from just above its confluence with the Ohio River to approximately 9.2 miles upstream of said confluence. The results of this LOMR were incorporated into the January 2, 2013, study (Reference 7).

Table 4, “Letters of Map Change”, lists LOMCs incorporated into the January 2, 2013, countywide study.

TABLE 4 – LETTERS OF MAP CHANGE

Community	Case Number	Project Identifier	Effective Date	Type
Wayne County	03-03-001P	Booton Realty, Inc. Property	January 17, 2003	LOMR
City of Kenova and Wayne County	09-03-0039P	Catlettsburg Refining	October 30, 2009	PMR

No LOMRs are being incorporated into this new revision.

2.2 Community Description

Wayne County is located in southwestern West Virginia. The total land area contained within the unincorporated areas is 506 square miles. Wayne County is bordered by the unincorporated areas of Lawrence County, Ohio, and Cabell County, West Virginia to the north; the unincorporated areas of Mingo County, West Virginia to the south; and the unincorporated areas of Boyd, Lawrence, and Martin Counties, Kentucky, to the west. The population of Wayne County was 42,481 in 2010, a slight decrease from the 2000 population of 42,903 (Reference 18).

The economy of the county is varied and includes heavy industry plants, chemical plants, light manufacturing, railroad transportation, coal transportation, coal mining and retail trade. The area is serviced by major transportation routes and is a major population center with level, developable, industrial or business sites.

There are three major Federal highways in Wayne County: Interstate Route 64 and U. S. Route 60 run east-west through the county, while U. S. Route 52 runs north-south through the county and generally parallels the Big Sandy River. The main lines of the CSX Railway run east-west through the county, and the Norfolk Southern Railway (formerly Norfolk and Western Railway) runs north-south through the county. The county lies within the Allegheny Plateau physiographic province. The physical characteristics of the county drainage area are molded by the middle the Ohio River Basin, the lower Twelvepole Creek Basin, and the Big Sandy River Basin.

The Big Sandy River forms the western boundary of Wayne County, separating West Virginia and Kentucky for a distance of 26.9 miles. It originates where the Tug Fork and the Levisa Fork join at Fort Gay, West Virginia, and Louisa, Kentucky. It then flows in a northerly direction to its confluence with the Ohio River at Kenova. Its total drainage area is 4,290 square miles. It has an approximate fall of 30 feet over its total length.

The Tug Fork, one of the two major tributaries that join at Fort Gay, West Virginia, forming the Big Sandy River, has its source in Tazewell County, Virginia. Flowing in a northwesterly direction, it forms the boundary between counties in Virginia and Kentucky with those in West Virginia. 33.8 miles of the Tug Fork border Wayne County from its mouth at Fort Gay to the Wayne-Mingo county boundary at the mouth of Marrowbone Creek. Its total drainage area is 1,558.8 square miles with an approximate fall of 58 feet throughout its length within Wayne County.

Twelvepole Creek flows in a northerly direction through Wayne County for 32.4 miles and joins the Ohio River at river mile 313.3. It originates at the confluence of East Fork and West Fork of Twelvepole Creeks, approximately 1 mile upstream of the Town of Wayne. Its total drainage area is 442.26 square miles.

West Fork of Twelvepole Creek, one of the two major tributaries that join to form Twelvepole Creek, arises at the foot the divide ridge separating Mingo and Logan Counties near Dingess. It then flows in a northerly direction 28.8 miles through Wayne County. Its total drainage area is 114.8 square miles.

Mill Creek, Marrowbone Creek, and Jennie Creek are minor tributaries of the Tug Fork, having drainage areas of 25.2, 22.6, and 15.5 square miles, respectively.

The climate of Wayne County is classified as continental, characterized by large, annual, daily, and day-to-day ranges of temperature. Wayne County is affected by frontal air mass activity of the continental polar and maritime tropical variety, having frequent, sudden changes. Weather changes occur every few days from the passing of cold or warm fronts and associated centers of high and low pressure.

The January average high temperature is 41 degrees Fahrenheit (F) and the low is 25 F. July has an average high of 85F and a low of 65F. The precipitation averages 3.2 inches in January and 4.5 inches in July with a yearly average of 42.3 inches. The average annual snowfall is 26 inches, and the growing season averages 6 months.

Broad valleys with steep-sided hills characterize the areas along the Ohio River and along the lower portions of the Big Sandy River. The upper portions of the Big Sandy River and Twelvepole Creek have narrow valleys and steep-sided hills that range from approximately 300 to 700 feet above the streambed. Generally, the hilltops are narrow ridges that form divides. A few ridge tops are broad plateau remnants with gentle slopes.

2.3 Principal Flood Problems

Floods can occur in Wayne County during any season of the year. They can result from periods of general rainfall over the entire area and from short intense periods of localized thunderstorms common to the region.

Newspaper accounts and other historical records for the 1800's show that large floods on the Ohio River occurred in 1806, 1832, 1847, 1852, 1865, 1872, 1880, 1883, 1884, 1897, and 1898. Major floods in the 1900's occurred in 1907, 1913, 1918, 1933, 1936, 1937, 1945, 1948, 1950, 1955, 1962, 1963, 1964, 1977, and 1997.

The highest flood of record for the Ohio River occurred on January 27, 1937, when it reached an elevation of 559.2 feet at U. S. Geological Survey (USGS) gage No. 03206000 (river mile 311.5) in Huntington. The 1937 flood was approximately 7 feet higher than current estimates of the 1-percent-annual-chance flood.

Major floods on the Big Sandy River have occurred in 1875, 1908, 1913, 1918, 1937, 1939, 1950, 1955, 1957, 1958, 1962, and 1977. The highest flood of record occurred on April 7, 1977. At USACE gage No. 03215000 (river mile 26.2) in Louisa the peak flow was 84,200 cubic feet per second (cfs).

Major floods on the Tug Fork have occurred in 1875, 1955, 1956, 1957, 1958, 1963, 1967, 1977, 1978, 1984, 1994, and 1996. The highest flood of record occurred on April 5, 1977, when it reached an elevation of 653.2 feet at USGS gage No. 03213700 (river mile 57.4) in Williamson, with approximately 50,000 cfs peak flow.

Major floods of the Twelvepole Creek have occurred in 1928, 1932, 1935, 1939, 1942, 1943, 1948, 1950, 1951, 1952, 1962, 1967, 1968, 1969, 1972, 1974, 1975, 1978, 1994, and 1996. The highest flood of record occurred on February 4, 1939, when it reached an elevation of 607.5 feet at USGS gage No. 03207020 (river mile 26.8) in Wayne.

2.4 Flood Protection Measures

In the Ohio River basin upstream from Wayne County, there are 38 existing reservoirs being operated for flood control as well as for other purposes.

In the Big Sandy River basin upstream from Wayne County, the following five existing reservoirs are being operated for flood control as well as for other purposes: North Fork of Pound, since January 1966; John W. Flannagan, since December 1963; Fishtrap, since February 1969; Dewey, since July 1949; Paintsville, since September 1983; and Yatesville, since August 1991.

In the Twelvepole Creek basin in Wayne County, the following two reservoirs are being operated for flood control as well as for other purposes: East Lynn Lake and dam, since April 1971 and Beech Fork Lake and dam, since January 1978. Information in this study concerning probable future flood levels reflects the reductions in flood heights attributable to these existing reservoirs.

Levee systems that are determined to provide protection from the 1-percent-annual-chance flood are accredited by FEMA. FEMA can also grant provisional accreditation to a levee system that was previously accredited on an effective FIRM and for which FEMA is awaiting data and/or documentation to demonstrate compliance with Section 65.10. These levee systems are referred to as Provisionally Accredited Levees (PALs). Provisional accreditation provides communities and levee owners with a specified timeframe to obtain the necessary data to confirm the levee's certification status. If the required information for a PAL is not submitted within the required timeframe, or if information indicates that a levee system no longer meets Section 65.10, FEMA will de-accredit the levee system and issue an effective FIRM showing the levee-impacted area as a SFHA.

FEMA coordinates its programs with USACE, who may inspect, maintain, and repair levee systems. The USACE has authority under Public Law 84-99 to supplement local efforts to repair flood control projects that are damaged by floods. Like FEMA, the USACE provides a program to allow public sponsors or operators to address levee system maintenance deficiencies. Failure to do so within the required timeframe results in the levee system being placed in an inactive status in the USACE Rehabilitation and Inspection Program. Levee systems in an inactive status are ineligible for rehabilitation assistance under Public Law 84-99.

Please note the levee information presented in this FIS is subject to change at any time. For that reason, the latest information regarding any USACE structure presented in this FIS should be obtained by contacting the USACE and accessing the USACE national levee database. For levees owned and/or operated by someone other than the USACE, contact the local community.

A system of levees and floodwalls surrounds the City of Kenova along the Ohio River and the Big Sandy River, and continues into the Town of Ceredo. FEMA specifies that all levees must have a minimum of three feet of freeboard against 1-percent-annual-chance flooding to be considered a safe flood protection structure. The levees in Kenova meet FEMA's requirement.

The Town of Ceredo is protected by the Ceredo and Kenova, West Virginia, Local Protection Project (LPP). The LPP is located along the Ohio River at Ceredo and the City of Kenova, and is comprised of 13,900 feet of earthen levee, 8,630 feet of concrete wall, six pump stations, two traffic ramps and 27 gated openings. Construction of the project was started in March 1939 and completed in November 1940 and protects approximately 710 acres in the two communities.

The design level of protection for the project is the flood of record, which occurred in January 1937, with three feet of freeboard. This level of protection is in excess of a 1-percent-annual-chance frequency of flooding elevation with sufficient freeboard to meet FEMA levee requirements.

Refer to Section 3.2 of this report for detailed information about flood hazards behind levees.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the county, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood event of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 1-percent-annual-chance flood (1-percent-chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the county.

Pre-countywide Analyses

For each community within Wayne County that had a previously printed FIS report, the unrevised hydrologic analyses described in those reports have been compiled and are summarized below by city or town.

In the Town of Fort Gay, discharge-frequency data for the Big Sandy River and the Tug Fork were provided by the USACE (References 19 and 20). Data for the Big Sandy River were based upon frequency analysis of records at the Louisa, Kentucky auxiliary gage, which had been in operation for 39 years. Data for the Tug Fork were based on a generalized curve for the Big Sandy River basin. Values of the 10-, 2-, 1, and 0.2-percent-annual-chance peak discharges for the Tug Fork were obtained from this curve.

Records for the Big Sandy River at the Louisa, Kentucky auxiliary gage reveal that the 1939, 1955, and 1957 floods were approximately 57,000, 53,000, and 57,000 cfs, respectively, less than the 1-percent-annual-chance flood analyzed in this study.

Because Mill Creek has no streamflow record, provisional equations being developed by the USGS (Reference 21) to update previous reports were applied to establish the 10-, 2-, and 1-percent-annual-chance peak discharges. These equations were based on log-Pearson Type III analyses of gaging station records with subsequent regression analysis to define the parameters for application to the ungaged watersheds. The 0.2-percent-annual-chance frequency peak discharges were determined by using an equation developed from an extrapolation of the constants used in the USGS's provisional equations.

In the City of Kenova, Towns of Ceredo and Wayne, and unincorporated areas of Wayne County; natural discharge-frequency curves were used for all the streams studied by detailed methods and were based on a regional analysis developed in accordance with the methods outlined by Leo R. Beard and USGS Bulletin 17B (References 19 and 20). Twenty USGS stream gaging stations in the surrounding drainage basins were used in the regional analysis. Periods of record ranged from 16 to 60 years and represent drainage areas of 31 to 3,892 square miles. A recurrence interval of 60 years was adopted as being representative of the data and was used in computing the estimated frequency for each evaluating center.

January 2, 2013 Analyses

No new detailed hydrologic analyses were performed as part of the January 2, 2013, study.

New approximate hydrology was performed throughout the county using regional regression equations (Reference 22).

For this revision, Tug Fork and Ponding Areas Analyses

Hydrologic analyses were carried out to establish the peak elevation-frequency relationships for floods of the selected recurrence intervals for the Tug Fork. Hydrologic analyses are typically performed at the watershed level and depend on factors such as watershed size and shape; land use and urbanization; natural or man-made storage; and various models or methodologies may be applied. A gage analysis was applied to develop the discharges used in the hydraulic analyses for the Tug Fork. A remedial analysis was applied to develop the hydraulic analyses for the ponding areas. Greater detail (including assumptions, analysis, and results) is available in the archived project documentation.

One USGS stream gage station at Glenhayes in the surrounding drainage basin was used in the regional analysis. The represented drainage area for the Tug Fork is 1,507 square miles, and the gage records reflect a period ranging from April 1977 to May 1995 (18 years).

A summary of drainage area-peak discharge relationships for the streams studied by detailed methods is shown below in Table 5, “Summary of Discharges.”

The stillwater elevations for the 1-percent-annual-chance flood for Ponding Areas 1 through 4 are shown in Table 6, “Summary of Stillwater Elevations.”

TABLE 5 – SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	4-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
BIG SANDY RIVER						
At confluence with Ohio River	4,290.0	87,000	*	120,400	136,300	169,200
Above confluence with Durbin Creek	4,236.0	82,200	*	114,700	130,600	162,800
Above confluence with Blaine Creek	3,904.0	76,000	*	104,900	118,700	152,600
Confluence with Tug and Levisa Forks	3,878.0	79,800	*	120,500	142,500	205,000
BUFFALO CREEK						
At confluence with Twelvepole Creek	8.5	1,400	*	2,300	2,750	3,930
Above Indian Branch Road	5.9	1,060	*	1,820	2,200	3,200
JENNIE CREEK						
At confluence with Tug Fork	15.5	2,070	*	3,400	4,000	5,600
At confluence with Mudlick Fork	12.7	1,689	*	2,775	3,265	4,570
Above river mile 40	8.3	1,108	*	1,821	2,142	2,999
KROUTS CREEK						
At downstream study limit at the confluence with Twelvepole Creek	1.9	465	*	860	1,070	1,700
MARROWBONE CREEK						
At confluence with Tug Fork	22.6	2,450	*	4,000	4,800	6,800
MILL CREEK						
At mouth	25.0	3,000	*	4,800	5,600	7,600
Above confluence with Paddle Creek	20.7	2,580	*	4,120	4,800	6,600
OHIO RIVER						
At downstream corporate limit of City of Kenova	60,660.0	451,000	*	545,000	587,000	697,000
Above confluence with Big Sandy River	56,370.0	428,000	*	519,000	563,000	676,000
At Huntington Gage (River Mile 311.6)	55,900.0	425,000	*	518,000	560,000	672,000
Upstream of confluence with Confluence with Guyandotte River	53,773.0	417,000	*	507,000	549,000	656,000
PONDING AREA 1						
At Porter Avenue pump station	0.11	*	*	*	946	*
PONDING AREA 2						
At Tri-State pump station	0.16	*	*	*	492	*
PONDING AREA 3						
At 19th Street pump station	0.30	*	*	*	552	*
PONDING AREA 4						
At 9th Street pump station	0.37	*	*	*	524	*

* Discharge not determined

TABLE 5 – SUMMARY OF DISCHARGES - continued

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-PERCENT	4-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
TUG FORK						
Just upstream of the confluence with Levisa Fork	1,556.0	33,300	42,200	49,300	56,600	74,600
Gage at Glenhayes	1,507.0	35,500	45,300	53,200	61,400	81,900
Just upstream of the confluence of Rockcastle Creek	1,183.0	42,000	54,800	65,300	76,400	105,000
TWELVEPOLE CREEK						
At confluence with Ohio River	442.3	12,200	*	17,800	20,300	27,000
Above confluence with Buffalo Creek	419.3	11,600	*	17,100	19,500	25,600
Above confluence with Beech Fork	318.4	7,900	*	11,800	13,500	18,000
Above confluence with Garrett Creek	302.3	7,600	*	11,200	12,600	16,400
At USGS gage No. 03207020 in Wayne	300.4	7,400	*	10,700	12,350	16,100
WEST FORK TWELVEPOLE CREEK						
At confluence with Twelvepole Creek	114.8	8,400	*	12,800	14,600	19,300
Above confluence with Trace Fork	97.2	7,600	*	11,400	13,100	17,300
Above confluence with Moses Fork	43.5	4,900	*	7,300	8,400	11,000

* Discharge not determined

TABLE 6 – SUMMARY OF STILLWATER ELEVATIONS

FLOODING SOURCE AND LOCATION	ELEVATION (feet NAVD 88*) 10-PERCENT	4-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
PONDING AREA 1					
At Porter Avenue	*	*	*	553.6	*
PONDING AREA 2					
At Tri-State	*	*	*	539.3	*
PONDING AREA 3					
At 19th Street	*	*	*	545.4	*
PONDING AREA 4					
At 9th Street and Main Street	*	*	*	541.2	*

* North American Vertical Datum of 1988

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals. Users should be aware that base flood elevations shown on the FIRM represent rounded whole-foot elevations and may not exactly reflect the elevations shown on the Flood Profiles or in the Floodway Data tables in the FIS report. Flood elevations shown on the FIRM are primarily intended for flood insurance rating purposes. For construction and/or floodplain management purposes, users are cautioned to use the flood elevation data presented in this FIS in conjunction with the data shown on the FIRM. The hydraulic analyses for this FIS were based on unobstructed flow. The flood elevations shown on the Flood Profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Cross sections for the backwater analyses were compiled by photogrammetric methods to model conveyance of the valleys. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

For streams for which hydraulic analyses were based on cross sections, locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross-section locations are also shown on the FIRM (Exhibit 2).

Pre-countywide Analyses

For each incorporated community in Wayne County that had a previously printed FIS report, the hydraulic analyses described in those reports have been compiled and are summarized below.

Water-surface elevations of floods of the selected recurrence intervals for Wayne County were computed using the USACE HEC-2 step-backwater computer program (Reference 21). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. Starting water-surface elevations for the streams studied by detailed methods were determined using the slope/area method. The Ohio River elevations were based on information provided by the Huntington gage.

The Ohio River was studied by detailed methods throughout the study area. For the 1989 FIS, cross sections for the backwater analyses of the Ohio River were determined using topographic maps at a scale of 1:7,200 with a contour interval of 5 feet (Reference 23). The below-water sections of the stream channel were obtained from soundings printed on USACE mapping.

The Big Sandy River was studied by detailed methods throughout the study area. For the 1978 FIS, all computer data, including roughness factors, cross section geometry, and starting water-surface elevations, for the Big Sandy River and the Tug Fork were provided by the USACE from data previously used in the "Big Sandy River Flood Plain Information Report" (Reference 24). Data were also provided on the reconstruction of Lock and Dam No. 3, located just downstream of the Town of Fort Gay corporate limits. This data included revised flood profiles (Reference 21) illustrating the effect of the reconstruction on flood profiles of selected recurrence intervals. From these flood profiles, it may be noted that the 10-year flood will be increased by approximately 0.5 foot above Lock and Dam No.3, while the 10-, 2-, 1-, and 0.2-percent-annual-chance flood profiles will be unaffected. This report reflects these findings.

For the 1989 FIS, cross sections for the backwater analyses of the Ohio River and the Big Sandy River were determined using topographic maps at a scale of 1:7,200 with a contour interval of 5 feet (Reference 23). The below-water sections of the stream channel were obtained from soundings printed on USACE mapping. Field soundings for the Big Sandy River were made at the bridges. In addition, cross sections for the Big Sandy River were determined using topographic maps at a scale of 1:2,400 with a contour interval of 5 feet, compiled from aerial photographs taken in April 1984 (Reference 25). The below-water sections of the stream channel were field surveyed at all bridges. The below-water sections of the channel at natural valley sections were modified from the surveyed channel at the nearest bridge. Cross sections were located at close intervals above and below bridges in order to compute the backwater effects from these structures. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

The cross sections for the computer analysis on the Big Sandy River were obtained from the Greenup pool charts (1959) and were used for the "Big Sandy River Flood Plain Information Report" (Reference 24). The sections located in the first 8.3 miles of the Big Sandy River were modified to reflect current dredging conditions. For all other detailed studied streams, cross sections were determined using topographic maps compiled from aerial photography at a scale of 1:2,400 with a contour interval of 5 feet (References 25, 26, 27, and 28). Below-water sections of the stream channels were field surveyed at all bridges. Below-water sections of the channel at natural valley sections were modified from the surveyed channel of the nearest bridge. Cross sections were located at close intervals above and below bridges in order to compute the backwater effects from these structures. All bridges and culverts were field surveyed to obtain elevation data and structural geometry.

Jordans Branch was studied by detailed methods throughout the study area. On Jordans Branch, the 1-percent-annual-chance flood elevation is based on the maximum allowable sump level at the Jordans Branch Pump Station, above which damage will occur. The 1-percent-annual-chance elevations are controlled at the station through the operation of two pumps and a sluice gate, which allows low flows to pass, but is closed when Twelvepole Creek rises above an elevation of 540.4 feet.

Krouts Creek was studied by detailed methods up to the corporate limits coincident the CSX railroad alignment.

Mill Creek was studied by detailed methods for most of its reach. Cross section data for Mill Creek were obtained by aerial surveys, while bridge and culvert openings were field surveyed to obtain elevation data and structural geometry. Cross sections were located at close intervals above and below bridge and culvert openings in order to compute the significant backwater effects of these structures.

Twelvepole Creek, Buffalo Creek, Marrowbone Creek, Jennie Creek, and West Fork Twelvepole Creek were all studied by detailed methods.

Roughness coefficients (Manning's "n") used in the hydraulic computations were determined by characteristics of historical floods in the community and existing floodplain conditions. Where information existed, "n" values were verified by reproducing known high-water profiles with the HEC-2 computer program (Reference 21).

Water-surface elevations of floods of the selected recurrence intervals were computed using the USACE-HEC-2 step-backwater computer program. Starting water-surface elevations for the streams studied by detailed methods were determined by the slope/area method.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1).

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations show on the Flood Profiles are valid only if hydraulic structures remain unobstructed, and dams and other flood control structures operate properly and do not fail.

Levee Hazard Analysis

Some flood hazard information presented in prior FIRMs and in prior FIS reports for Wayne County and its incorporated communities was based on flood protection provided by levees. Based on the information available and the mapping standards of the NFIP at the time that the prior FISs and FIRMs were prepared, FEMA accredited the levees as providing protection from the 1-percent-annual-chance flood. For FEMA to continue to accredit the identified levees with providing protection from the base flood, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled "Mapping of Areas Protected by Levee Systems."

On August 22, 2005, FEMA issued Procedure Memorandum No. 34 - Interim Guidance for Studies Including Levees. The purpose of the memorandum was to help clarify the responsibility of community officials or other parties seeking recognition of a levee by providing information identified during a study/mapping project. Often, documentation regarding levee design, accreditation, and the impacts on flood hazard mapping is outdated or missing altogether. To remedy this, Procedure Memorandum No. 34 provides interim guidance on procedures to minimize delays in near-term studies/mapping projects, to help our mapping partners properly assess how to handle levee mapping issues.

While 44 CFR Section 65.10 documentation is being compiled, the release of more up-to-date FIRM panels for other parts of a community or county may be delayed. To minimize the impact of the levee recognition and certification process, FEMA issued Procedure Memorandum No. 43 - Guidelines for Identifying Provisionally Accredited Levees on March 16, 2007. These guidelines will allow issuance of preliminary and effective versions of FIRMs while the levee owners or communities are compiling the full documentation required to show compliance with 44 CFR Section 65.10. The guidelines also explain that preliminary FIRMs can be issued while providing the communities and levee owners with a specified time frame to correct any maintenance deficiencies associated with a levee and to show compliance with 44 CFR Section 65.10.

The communities within Wayne County have been contacted by FEMA in order to obtain data required under 44 CFR 65.10 to continue to show the levees as providing protection from the flood that has a 1-percent-chance of being equaled or exceeded in any given year.

FEMA understands that it may take time to acquire and/or assemble the documentation necessary to fully comply with 44 CFR 65.10. Therefore, FEMA has put forth a process to provide the communities with additional time to submit all the necessary documentation. For a community to avail itself of the additional time, it has to sign an agreement with FEMA. Levees for which such agreements have been signed are shown on the final effective FIRM as providing protection from the flood that has a 1-percent-chance of being equaled or exceeded in any given year, and are labeled as a Provisionally Accredited Levee (PAL). Communities have two years from the date of FEMA's initial coordination to submit to FEMA final accreditation data for all PALs. Following receipt of final accreditation data, FEMA will revise the FIS and FIRM as warranted.

FEMA has coordinated with the USACE, the local communities, and other organizations to compile a list of levees that exist within Wayne County. Table 7, “List of Levee Structures” lists all levees shown on the FIRM.

TABLE 7 – LIST OF LEVEE STRUCTURES

Community	Flood Source	Corps Survey ID / Temporary Levee ID (Lat./Long. Coordinates. ; FIRM panel)	USACE Levee
City of Kenova Town of Ceredo	Ohio River / Big Sandy River / Twelvepole Creek	1969/1970 Ceredo-Kenova Levee System (-82.593, 38.402, -82.558, 38.392) 54099C0015C, 54099C0020C)	Yes*

*USACE Federally constructed; turned over to public sponsor operations and maintenance

January 2, 2013 Analyses

New detailed hydraulic analyses have been performed on the Big Sandy River at the confluence of the Ohio River (Reference 7).

New approximate hydraulic analyses have been performed on all previously effective approximate stream reaches as part of the January 2, 2013, study (Reference 9).

For this revision, Tug Fork and Ponding Areas Analyses

In the unincorporated areas of Wayne County and the Town of Fort Gay, the Tug Fork was studied by detailed methods using the USACE’s HEC-RAS model, version 4.1 (Reference 29). All hydraulic models are one-dimensional and assume steady flow. In addition, all models assume a completely subcritical water surface profile. HEC-RAS models were developed for the 10-, 4-, 2-, 1-, and 0.2-percent-annual-chance flood events.

In the Town of Ceredo and the City of Kenova, Ponding Areas 1 through 4 were studied by detailed methods using the USACE’s HEC-HMS model (Reference 11). HEC-HMS data was developed for the 1-percent-annual-chance flood event.

Roughness factors (Manning’s “n”) used in the hydraulic computations were assigned on the basis of field inspection of the floodplain areas. These computations depend on such factors as type and amount of vegetation, channel configuration, and water depth.

The channel “n” and overbank “n” values for the streams studied by detailed methods are shown in Table 8, “Manning’s ‘n’ Values.”

TABLE 8 – MANNING'S "n" VALUES

Stream	Channel "n"	Overbank "n"
Big Sandy River	0.021 – 0.046	0.031 – 0.120
Buffalo Creek	0.041 – 0.043	0.050 – 0.065
Jennie Creek	0.042 – 0.045	0.047 – 0.085
Krouts Creek	0.030 – 0.045	0.050 – 0.080
Marrowbone Creek	0.045	0.085
Mill Creek	0.045 – 0.050	0.040 – 0.070
Ohio River	0.029	0.035 – 0.066
Tug Fork	0.022-0.041	0.045-0.100
Twelvepole Creek	0.055 – 0.065	0.101 – 0.130
West Fork Twelvepole Creek	0.043	0.047 – 0.054

Qualifying bench marks within a given jurisdiction are cataloged by the National Geodetic Survey (NGS) and entered into the National Spatial Reference System (NSRS). First or Second Order Vertical bench marks that have a vertical stability classification of A, B, or C are shown and labeled on the FIRM with their 6-character NSRS Permanent Identifier.

Bench marks cataloged by the NGS and entered into the NSRS vary widely in vertical stability classification. NSRS vertical stability classifications are as follows:

- Stability A: Monuments of the most reliable nature, expected to hold position / elevation well (e.g., mounted in bedrock)

- Stability B: Monuments which generally hold their position / elevation well (e.g., concrete bridge abutments)

- Stability C: Monuments which may be affected by surface ground movements (e.g., concrete mounted below frost line)

- Stability D: Mark of questionable or unknown vertical stability (e.g., concrete monument above frost line, or steel witness post).

In addition to NSRS bench marks, the FIRM may also show vertical control monument established by a local jurisdiction; these monuments will be shown on the FIRM with the appropriate designations. Local monuments will only be placed on the FIRM if the community has requested that they be included, and if the monuments meet the aforementioned NSRS inclusion criteria.

To obtain current elevation, description, and/or location information for bench marks shown on the FIRM for this jurisdiction, please contact the Information Services Branch of the NGS at (301) 713-3242, or visit their Web site, www.ngs.noaa.gov.

It is important to note that temporary vertical monuments are often established during the preparation of a flood hazard analysis for the purposes of establishing local vertical control. Although these monuments are not shown on the digital FIRM, they may be found in the Technical Support Data Notebook associated with this FIS and FIRM. Interested individuals may contact FEMA to access this data.

3.3 Vertical Datum

All FISs and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FISs and FIRMs was the NGVD 29. With the finalization of the NAVD 88, many FIS reports and FIRMs are being prepared using NAVD 88 as the referenced vertical datum.

For the January 2, 2013, study, all flood elevations shown in the FIS report and on the FIRM are referenced to NAVD 88. Structure and ground elevations in the community must, therefore, be referenced to NAVD 88. It is important to note that adjacent communities may be referenced to NGVD 29. This may result in differences in base flood elevations across corporate limits between the communities.

As noted above, the elevations shown in the FIS report and on the FIRM for Wayne County are referenced to NAVD 88. Ground, structure, and flood elevations may be compared and/or referenced to NGVD 29 by applying a standard conversion factor. The conversion factor from NGVD 29 to NAVD 88 for Wayne County is -0.70 feet. The locations used to establish the conversion factor were USGS 7.5-minute topographic quadrangle corners that fell within the County, as well as those that were within 2.5 miles outside the County. The bench marks are referenced to NAVD 88.

The BFEs shown on the FIRM represent whole-foot rounded values. For example, a BFE of 102.4 will appear as 102 on the FIRM and 102.6 will appear as 103. Therefore, users that wish to convert the elevations in this FIS to NGVD 29 should apply the conversion factor (+0.70 foot) to elevations shown on the Flood Profiles and supporting data tables in this FIS report, which are shown at a minimum to the nearest 0.1 foot.

NGVD – 0.70’ = NAVD

For more information on NAVD 88, see Converting the National Flood Insurance Program to the North American Vertical Datum of 1988, FEMA Publication FIA-20/June 1992, or contact the National Geodetic Survey at the following address:

NGS, Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910
(301) 713-3242
http://www.ngs.noaa.gov/

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each FIS provides 1-percent-annual-chance flood elevations and delineations of the 1- and 0.2-percent-annual chance floodplain boundaries and 1-percent-annual-chance floodway to assist communities in developing floodplain management measures. This information is presented on the FIRM and in many components of the FIS report, including Flood Profiles, and Floodway Data tables. Users should reference the data presented in the FIS report as well as additional information that may be available at the local community map repository before making flood elevation and/or floodplain boundary determinations.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent-annual-chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent-annual-chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For the streams studied in detail, the 1- and 0.2-percent-annual-chance floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps. (References 13, 14, 15, 16, 26, 27, 28, and 30). For information regarding scale and sources of these maps, see Tables 9 and 10, "Original Sources of Topographic Data" and "Updated Sources of Topographic Data."

TABLE 9 – ORIGINAL SOURCES OF TOPOGRAPHIC DATA

LOCATION	SCALE	CONTOUR INTERVAL (Feet)
Town of Ceredo	1:7,200	5
	1:2,400	5
	1:600	2
Town of Fort Gay	1:24,000	10
City of Kenova	1:24,000	5
Town of Wayne	1:24,000	5
Wayne County	1:24,000	5

TABLE 10 – UPDATED SOURCES OF TOPOGRAPHIC DATA

LOCATION	SCALE	CONTOUR INTERVAL (Feet)
Town of Fort Gay	1:600	2
Wayne County	1:600	2

The 1- and 0.2-percent-annual-chance floodplain boundaries are shown on the FIRM. On this map, the 1-percent-annual-chance floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 0.2-percent-annual-chance floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 1- and 0.2-percent-annual-chance floodplain boundaries are close together, only the 1-percent-annual-chance floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the January 2, 2013, study, the conversion to the DFIRM and the development of new approximate Zone A floodplains are based upon updated topography provided by USGS and the West Virginia Statewide Addressing and Mapping Board (SAMB) 3 Meter Digital Elevation Models, 2003. The January 2, 2013, study also includes the transition from the NGVD 29 to the NAVD 88 (References 16).

For the January 2, 2013, study, the 1- and 0.2-percent-annual-chance floodplain boundaries on the Ohio River, the Big Sandy River, Mill Creek and Jennie Creek were delineated based upon existing updated topographic surveys, including the Ohio River 5' contours (1998), the Big Sandy River 5' contours (2002), the Big Sandy River 1' and 5'contours (undated) and Mill Creek and Jennie Creek 5' contours (1994) (References 13, 14, 15, and 30).

For this revision, the development of new detailed floodplains of the Tug Fork were based upon updated topography collected by Photoscience, Inc. using Light Detection and Ranging (LiDAR) data provided by the West Virginia Department of Environmental Protection (WVDEP). In addition, the floodplain boundaries for the interior ponding areas for the Town of Ceredo and the City of Kenova were based upon USGS topography collected by Summit Engineering, Inc. (Reference 11).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of floodplain management. Under this concept, the area of the 1-percent-annual-chance floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent-annual-chance flood can be carried without substantial increases in flood heights. Minimum federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (see Table 11, Floodway Data). The computed floodways are shown on the FIRM (Exhibit 2). In cases where the floodway and 1-percent-annual-chance floodplain boundaries are either close together or collinear, only the floodway boundary is shown. Portions of the floodway widths for the Big Sandy River, the Tug Fork, and Twelvepole Creek extend beyond the county boundary.

Near the mouths of streams studied in detail, floodway computations are made without regard to flood elevations on the receiving water body. Therefore, "Without Floodway" elevations presented in for certain downstream cross sections of the Big Sandy River, the Tug Fork, Twelvepole Creek, West Fork Twelvepole Creek, Mill Creek, Marrowbone Creek, Jennie Creek, and Buffalo Creek are lower than the regulatory flood elevations in that area, which must take into account the 1-percent-annual-chance flooding due to backwater from other sources.

For Jordans Branch, an alternative method was used, whereby the maximum storage area elevation (541.3 feet NAVD) was accepted as the base flood elevation. Contours of 2-feet were planimetered, and the volume of water contained in the storage area at elevation 541.3 was determined. The floodway encroachment was then performed equally around the circumference of the storage area so that the increase in volume obtained by raising the storage area one foot was offset by the decrease in volume obtained by the encroachment. This balance of volume occurred at an elevation of 536.4 feet NAVD.

The area between the floodway and 1-percent-annual-chance floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 1, "Floodway Schematic".

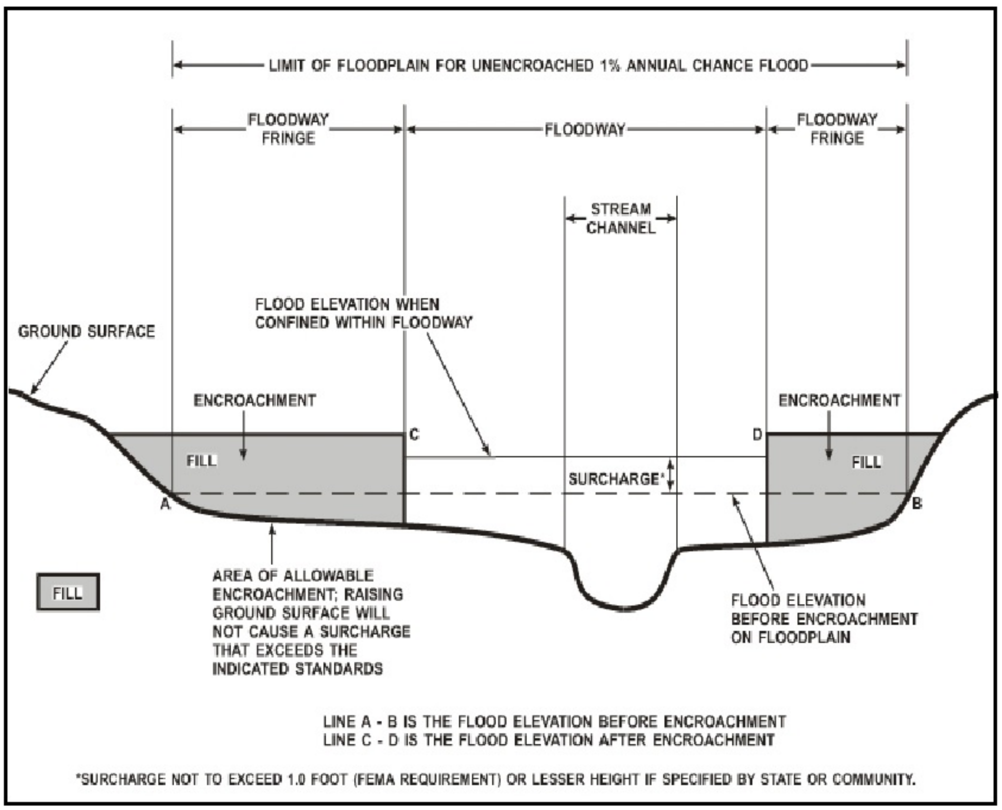


FIGURE 1 – FLOODWAY SCHEMATIC

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION FEET (NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Jennie Creek								
A	0.283	49	620	6.6	617.4	587.7 [2]	588.7	1.0
B	1.155	179	969	4.1	617.4	592.9 [2]	593.4	0.5
C	1.805	77	742	5.4	617.4	602.3 [2]	602.5	0.2
D	2.323	46	395	8.3	617.4	606.0 [2]	606.5	0.5
E	2.909	101	778	4.2	617.4	615.1 [2]	615.8	0.7
F	3.612	81	524	6.2	626.4	626.4	627.2	0.8
G	4.338	38	361	5.9	638.0	638.0	638.5	0.6
H	4.542	63	340	6.3	641.7	641.7	642.5	0.8
I	4.910	41	331	6.5	649.0	649.0	649.8	0.8
J	5.500	40	225	9.5	662.6	662.6	663.3	0.7
K	5.695	47	343	6.2	668.8	668.8	669.8	1.0

[1] Miles above confluence with Tug Fork

[2] Elevation computed without consideration of backwater effects from Tug Fork

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

JENNIE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION FEET (NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY[2]	WITH FLOODWAY	INCREASE
Marrowbone Creek								
A	0.037	97	1,083	4.4	624.5	591.6	592.4	0.8
B	0.233	59	686	7.0	624.5	592.8	593.6	0.8
C	0.549	134	1,167	4.1	624.5	595.6	596.6	1.0
D	0.769	67	531	9.0	624.5	597.8	598.2	0.4
E	0.980	158	1,182	4.1	624.5	601.1	602.0	0.9

[1] Miles above confluence with Tug Fork

[2] Elevation computed without consideration of backwater effects from Tug Fork

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV
AND INCORPORATED AREAS

FLOODWAY DATA

MARROWBONE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION FEET (NAVD88)			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Mill Creek								
A	0.180	63	466	7.1	574.4	567.3 [2]	568.2	0.9
B	0.350	68	539	6.2	574.4	567.3 [2]	568.2	0.9
C	0.510	111	803	4.1	574.4	567.3 [2]	568.2	0.9
D	0.700	39	235	14.1	574.4	567.3 [2]	568.2	0.9
E	0.730	26	281	11.6	574.4	567.3 [2]	568.2	0.9
F	0.900	90	1,034	3.2	574.4	567.3 [2]	568.2	0.9
G	1.050	90	821	4.0	574.4	567.3 [2]	568.2	0.9
H	1.488	290	1,619	3.5	574.4	567.3 [2]	568.2	0.9
I	1.934	120	982	5.7	574.4	567.3 [2]	568.2	0.9
J	2.805	252	1,759	3.2	574.4	574.4	575.2	0.8
K	3.646	198	1,322	3.6	580.3	580.3	581.1	0.8
L	4.242	212	1,643	2.9	586.4	586.4	586.9	0.5
M	4.648	101	784	6.1	588.4	588.4	589.1	0.7

[1] Miles above confluence with Tug Fork

[2] Elevation computed without consideration of backwater effects from Tug Fork

TABLE 9

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

MILL CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION FEET (NAVD 88)			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Tug Fork								
A	187 [3]	236/17	11,070	6.0	575.1	573.7 [4]	574.5	0.8
B	41,740	282/52	10,560	6.7	580.6	580.6	581.6	1.0
C	55,758	782/266	17,440	6.0	583.4	583.4	584.4	1.0
D	65,422	273/86	10,619	7.8	586.0	586.0	587.0	1.0
E	80,165	307/118	10,108	9.1	590.4	590.4	591.3	0.9
F	93,215	270/108	10,511	8.2	594.5	594.5	595.5	1.0
G	94,866	204/100	8,168	9.7	594.7	594.7	595.7	1.0
H	96,469	242/74	9,969	8.7	595.5	595.5	596.5	1.0
I	103,240	301/137	11,353	7.5	598.0	598.0	599.0	1.0
J	103,806	380/165	12,074	6.3	598.3	598.3	599.3	1.0
K	115,932	361/196	13,028	7.0	603.6	603.6	604.4	0.8
L	134,855	316/159	12,928	6.5	611.3	611.3	611.9	0.6
M	166,429	360/95	13,188	6.8	621.2	621.2	621.9	0.7
N	177,688	339/223	12,610	6.1	624.5	624.5	625.1	0.6

[1] Miles above confluence with Big Sandy River and Levisa Fork

[2] Width/Width within county

[3] Consider Levisa Fork floodway width for the cross section

4 Elevation computed without considering backwater effects from Big Sandy River

TABLE 10

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV AND INCORPORATED AREAS

FLOODWAY DATA

TUG FORK

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses were not performed for such areas, no base elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AO

Zone AO is the flood insurance rate zone that corresponds to the areas of 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. Average whole-foot depths derived from the detailed hydraulic analyses are show within this zone.

Zone A99

Zone A99 is the flood insurance rate zone that corresponds to areas of the 1-percent-annual-chance floodplain that will be protected by a Federal flood protection system where construction has reached specified statutory milestones. No base flood elevations or depths are shown within this zone.

Zone V

Zone V is the flood insurance zone that corresponds to the 1-percent-annual-chance coastal floodplains that have additional hazards associated with storm waves. Because approximate hydraulic analyses are performed for such areas, no base flood elevations are shown within this zone.

Zone VE

Zone VE is the flood insurance rate zone that corresponds to the 1-percent-annual-chance floodplains that have additional hazards associated with storm waves. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to the 0.2-percent-annual-chance floodplain, areas within the 0.2-percent-annual-chance floodplain, and to areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by levees. No base flood elevations or depths are shown within this zone.

Zone D

Zone D is the flood insurance rate zone that corresponds to unstudied areas where flood hazards are undetermined, but possible.

6.0 FLOOD INSURANCE RATE MAP

The FIRM is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 1-percent-annual-chance floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 1-percent-annual-chance and 0.2-percent-annual-chance floodplains. Floodways and the locations of selected cross sections used in the hydraulic analyses and floodway computations are shown where applicable.

The current FIRM presents flooding information for the entire geographic area of Wayne County. Historical map dates relating to the pre-countywide maps prepared for each community are presented in Table 12, “Community Map History.”

COMMUNTY NAME	INITIAL NFIP MAP DATE	FLOOD HAZARD BOUNDARY MAP REVISIONS DATE	INITIAL FIRM DATE	FIRM REVISIONS DATE
Ceredo, Town of	January 3, 1975	None	May 17, 1989	
Fort Gay, Town of	September 13, 1974	May 28, 1976	January 3, 1979	
Kenova, City of	May 3, 1974	May 28, 1976	May 17, 1989	
Wayne County (Unincorporated Areas)	February 21, 1975	January 22, 1982	September 18, 1987	
Wayne, Town of	January 10, 1974	None	September 30, 1987	

TABLE 12

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV
AND INCORPORATED AREAS

COMMUNITY MAP HISTORY

7.0 OTHER STUDIES

Information pertaining to revised and unrevised flood hazards for each jurisdiction within Wayne County, West Virginia, has been compiled into this FIS. Therefore, this FIS supersedes all previously printed FIS reports, and FIRMs for all of the incorporated and unincorporated jurisdictions within Wayne County, West Virginia.

Flood Insurance Studies for Cabell and Lincoln Counties, West Virginia have also been performed (References 31 and 32).

FISs are being conducted for Mingo County and Incorporated Areas, West Virginia, which borders Wayne County to the southeast, Boyd County and Incorporated Areas, Kentucky, to the northwest, Lawrence County and Incorporated Areas, Kentucky, to the west, and the Unincorporated Areas of Martin County, Kentucky, to the southwest.

This FIS report either supersedes or is compatible with all previous analyses on streams studied in this report and should be considered authoritative for purposes of the NFIP.

A watershed work plan for the Fourpole Creek watershed was published by the Soil Conservation Service (SCS) in 1966 (Reference 33). A Floodplain Information report has also been published by the USACE (Reference 21). Those studies are not in agreement with this study due to the updated information used in this study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting Federal Insurance and Mitigation Division, FEMA Region III, One Independence Mall, Sixth Floor, 615 Chestnut Street, Philadelphia, PA 19106-4404.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of Ceredo, Wayne County, West Virginia, Washington, D. C., May 17, 1989.

2. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Wayne County, West Virginia, September 18, 1987.

3. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of Fort Gay, Wayne County, West Virginia, Washington, D. C., July 1978.

4. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, City of Kenova, Wayne County, West Virginia, Washington, D. C., May 17, 1989.

5. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of Wayne, Wayne County, West Virginia, Washington, D. C., September 30, 1987.

6. U. S. Army Corps of Engineers, Huntington District, Digital Conversion of Effective Flood Insurance Studies for FEMA, Huntington W.V., December 2010.

7. Stantec Consulting Services, Inc. (formerly known as FMSM, Inc.), Big Sandy River Flood Study and Physical Map Revision, Lexington Kentucky, May 2009.

8. U.S. Army Corps of Engineers, Flood Plain Management Services (FPMS) program, Spring Valley (Krouts Creek) Flood Study, Wayne County, West Virginia, January 2010.

9. AMEC Earth and Environmental, Flood Study of Wayne County West Virginia Approximate Floodplains, Chantilly VA, June 2010.

10. URS and Kentucky Department of Water, Hydraulics Report for Tug Fork Watershed - HUC8 05070201, MAS Cooperative Agreement EMA-2011-CA-5145, Louisville, Kentucky, October 2, 2013.

11. Summit Engineering, Inc., Ceredo-Kenova Flood Control Works, Interior Drainage Study, Lexington, Kentucky, April 22, 2013.

12. West Virginia Statewide Address and Mapping Board (SAMB), Natural Color Digital Orthophotos, 1:2,400 scale, high-resolution, 2003.

13. U.S. Army Corps of Engineers, source unknown, Big Sandy River 5 Foot Topographic Contours and Spot Elevations, Huntington West Virginia, 2002.

14. Barton Aerial Technologies, Inc. and Horizons Inc., Ohio River Digital Orthophotography and Photogrammetrically-Derived 5 foot Contours and Spot Elevations, Performed under Contract No. DACW43-98-D-0510 – Delivery Order No. 0007, prepared for U.S. Army Corps of Engineers St. Louis District, St. Louis Missouri, April 5, 1998.

15. Photo Science Inc. and Aero-Metric Engineering, Tug Fork Valley Project, Orthophotography and Photogrammetrically-Derived 5 foot Contours and Spot Elevations, 1994.

16. West Virginia State Address and Mapping Board, West Virginia Statewide Digital Elevation Models, 3 Meter DEMs supporting topographically correct 10-foot contour intervals, Morgantown, WV, 2005.

17. Booton Realty Inc., Letter of Map Revision, FEMA Case Number 03-03-001P, January 13, 2003.

18. U. S. Census Bureau; "State & County QuickFacts – Wayne County, West Virginia"; Population 2010; http://quickfacts.census.gov/qfd/states/54/54099.html, June 11, 2014.

19. Leo. R. Beard, Statistical Methods in Hydrology, Sacramento, California, U. S. Army Corps of Engineers, January 1962.

20. U. S. Department of the Interior, Geological Survey, Office of Water Data Collection, Interagency Advisory Committee on Water Data, Guidelines for Determining Flood Flow Frequency, Bulletin 17B, Reston, Virginia, Revised September 1981.

21. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, October 1973.

22. L. Robert Kimball and Associates, Topographic Maps compiled from aerial photographs, Scale 1:2,400, Contour Interval 5 Feet: Wayne County, West Virginia, flown in December 1981.

23. Ohio River Contours, source unknown, 1989.

24. State of West Virginia, Division of Water Resources in cooperation with the U. S. Army Corps of Engineers, Huntington District, Big Sandy River Flood Plain Information Report, Huntington, West Virginia, June 1972.

25. L. Robert Kimball and Associates, Topographic Maps compiled from aerial photographs, Scale 1:2,400, Contour Interval 5 Feet: Wayne County, West Virginia, flown in April 1984.

26. Kucera and Associates, Topographic Maps compiled from aerial photographs, Scale 1:2,400, Contour Interval 5 Feet: Wayne County, West Virginia, April 7, 1978.

27. Photo Science, Inc., Topographic Maps compiled from aerial photographs, Scale 1:2,400, Contour Interval 5 Feet: Wayne County, West Virginia, flown in April 1985.

28. Marathon Petroleum Company, LLC, source unknown, Catlettsburg Refinery, Tri-State and Kenova Marine Terminal facilities 1-Foot Topographic Contours and vicinity 5-Foot Topographic Contours, Catlettsburg, Kentucky, undated.

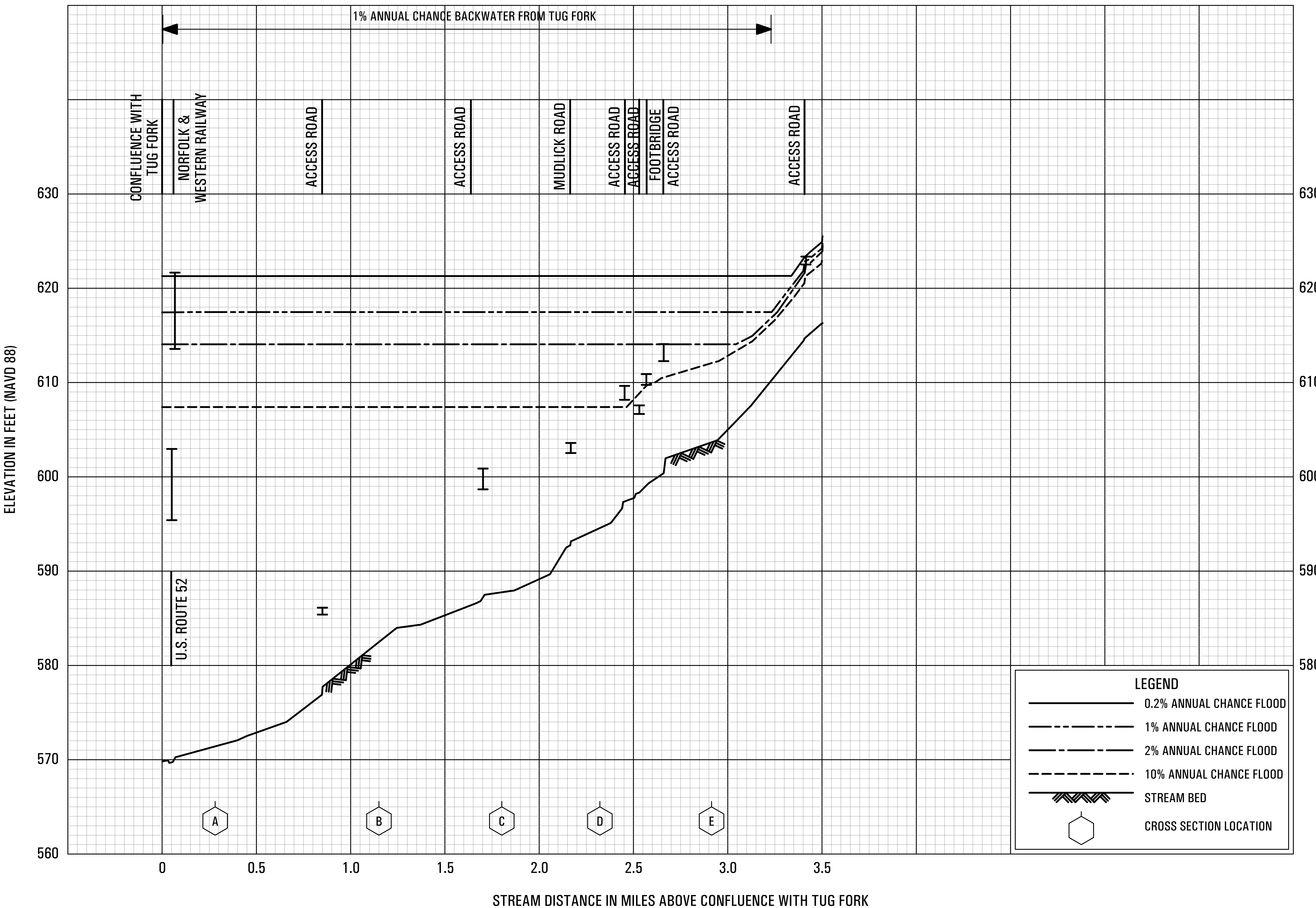
29. U.S. Army Corps of Engineers, Hydrologic Engineering Center, River Analysis System, HEC-RAS, Version 4.1, Davis, California, January 2010.

30. Federal Emergency Management Agency, Flood Insurance Study, Unincorporated Areas of Mingo County, West Virginia, Washington, D. C., December 4, 1984.

31. Federal Emergency Management Agency, Flood Insurance Study, Cabell County, West Virginia and Incorporated Areas, Washington, D. C., February 19, 2014.

32. Federal Emergency Management Agency, Flood Insurance Study, Lincoln County, West Virginia and Incorporated Areas, Washington, D. C., October 16, 2013.

33. U. S. Department of Agriculture, Soil Conservation Service, Morgantown Office, Fourpole Creek Watershed Work Plan, Morgantown, West Virginia, March 1966.



FLOOD PROFILES

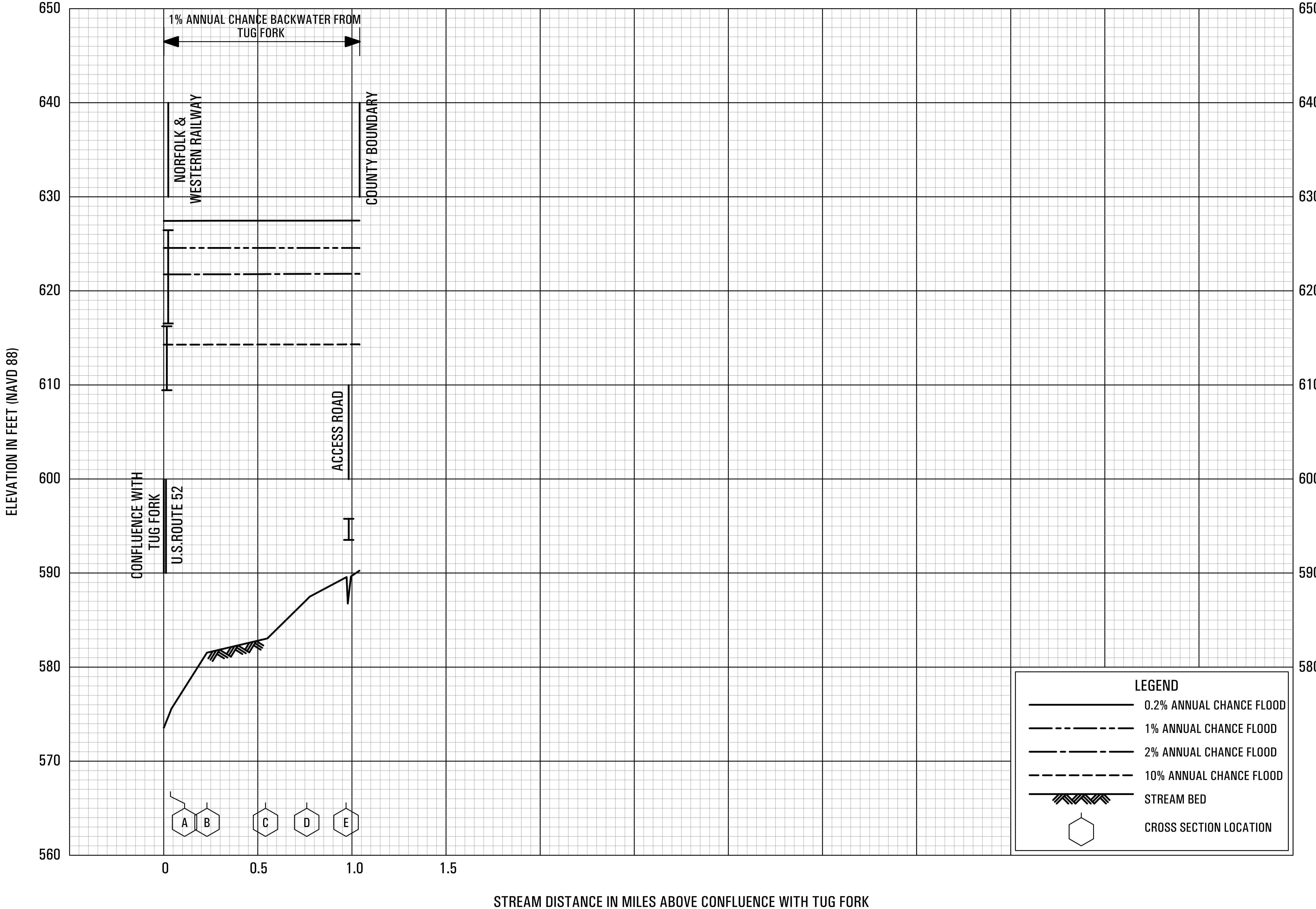
JENNIE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV

AND INCORPORATED AREAS

08P



FLOOD PROFILES

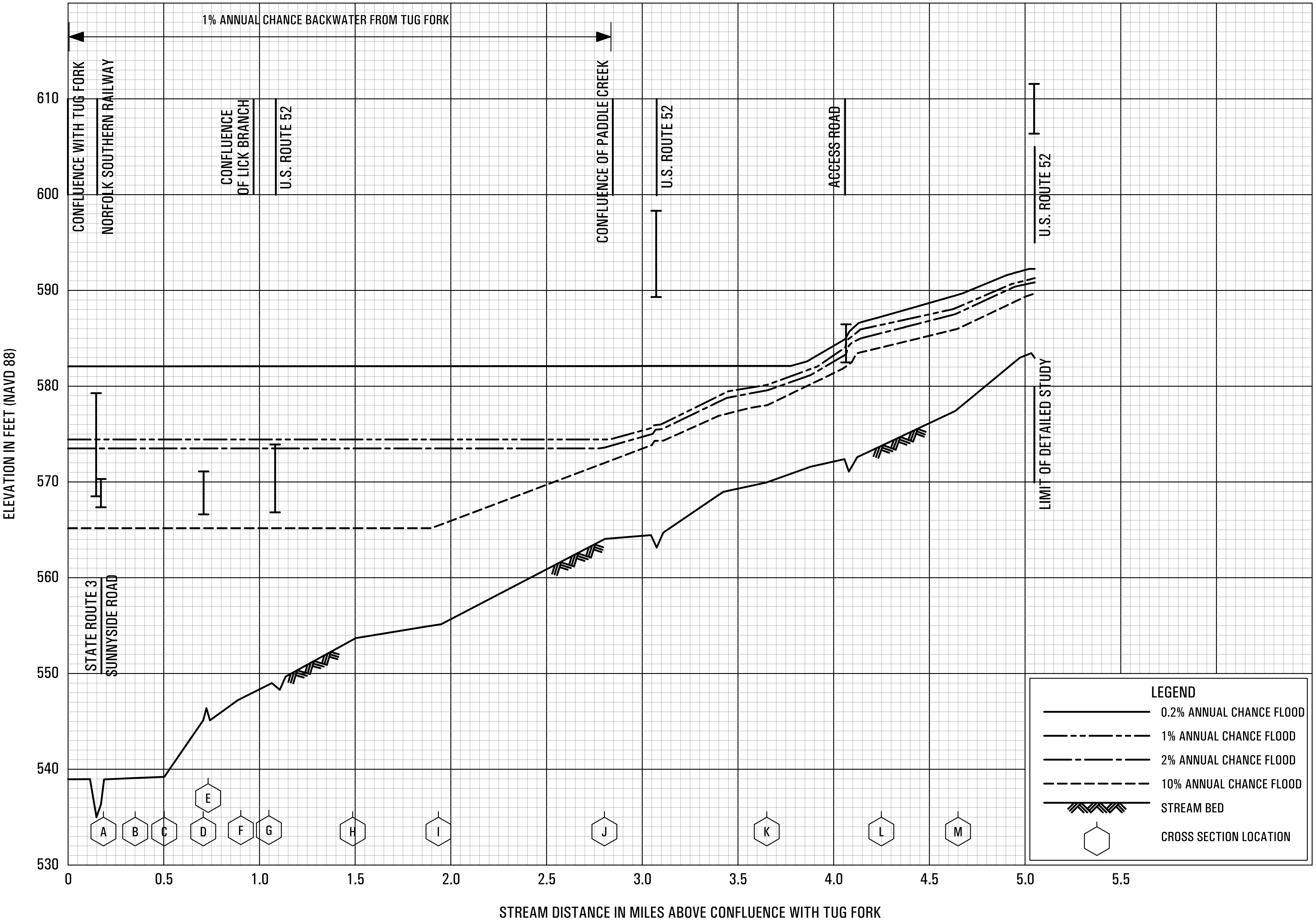
MARROWBONE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV

AND INCORPORATED AREAS

11P



FLOOD PROFILES

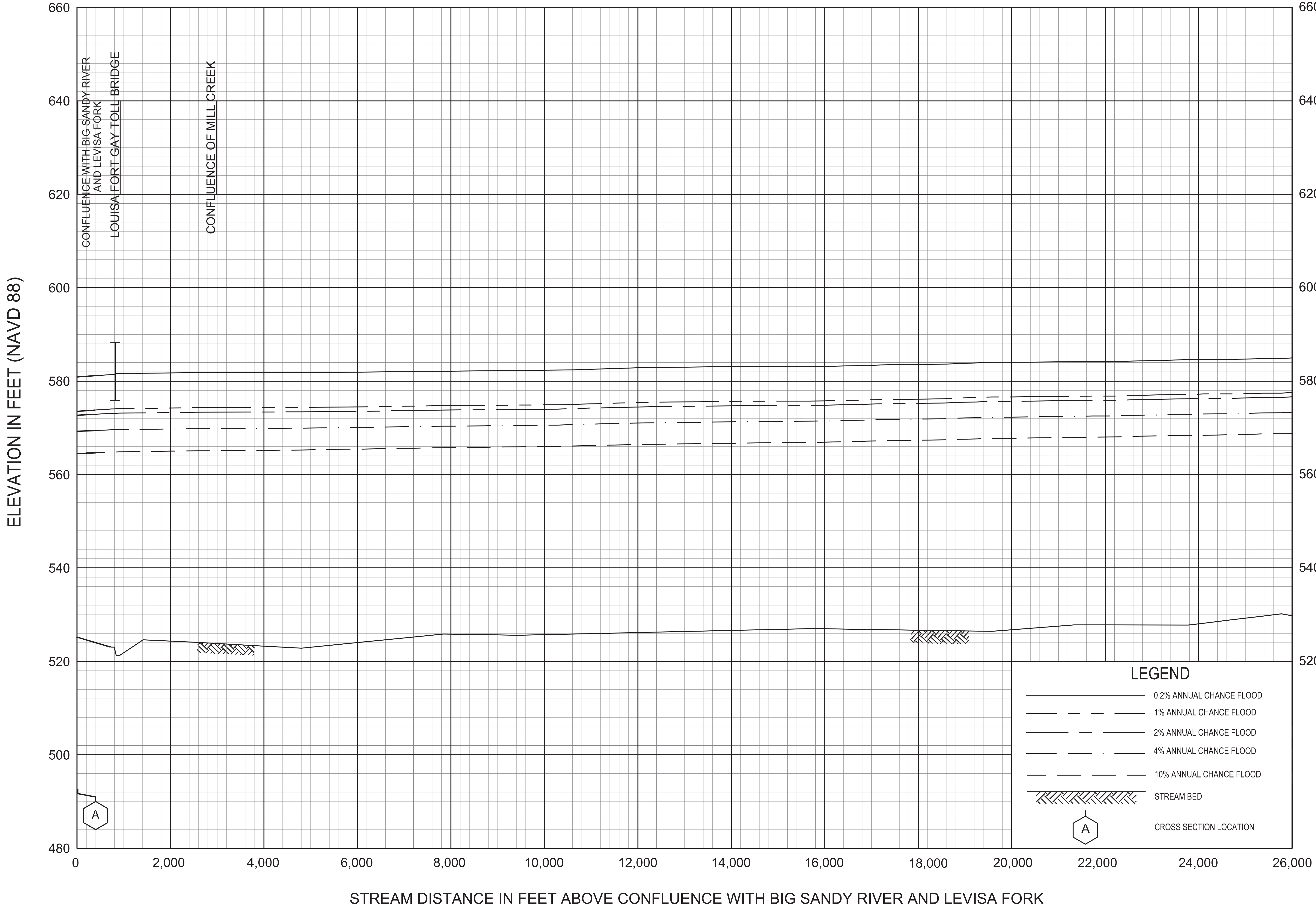
MILL CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV

AND INCORPORATED AREAS

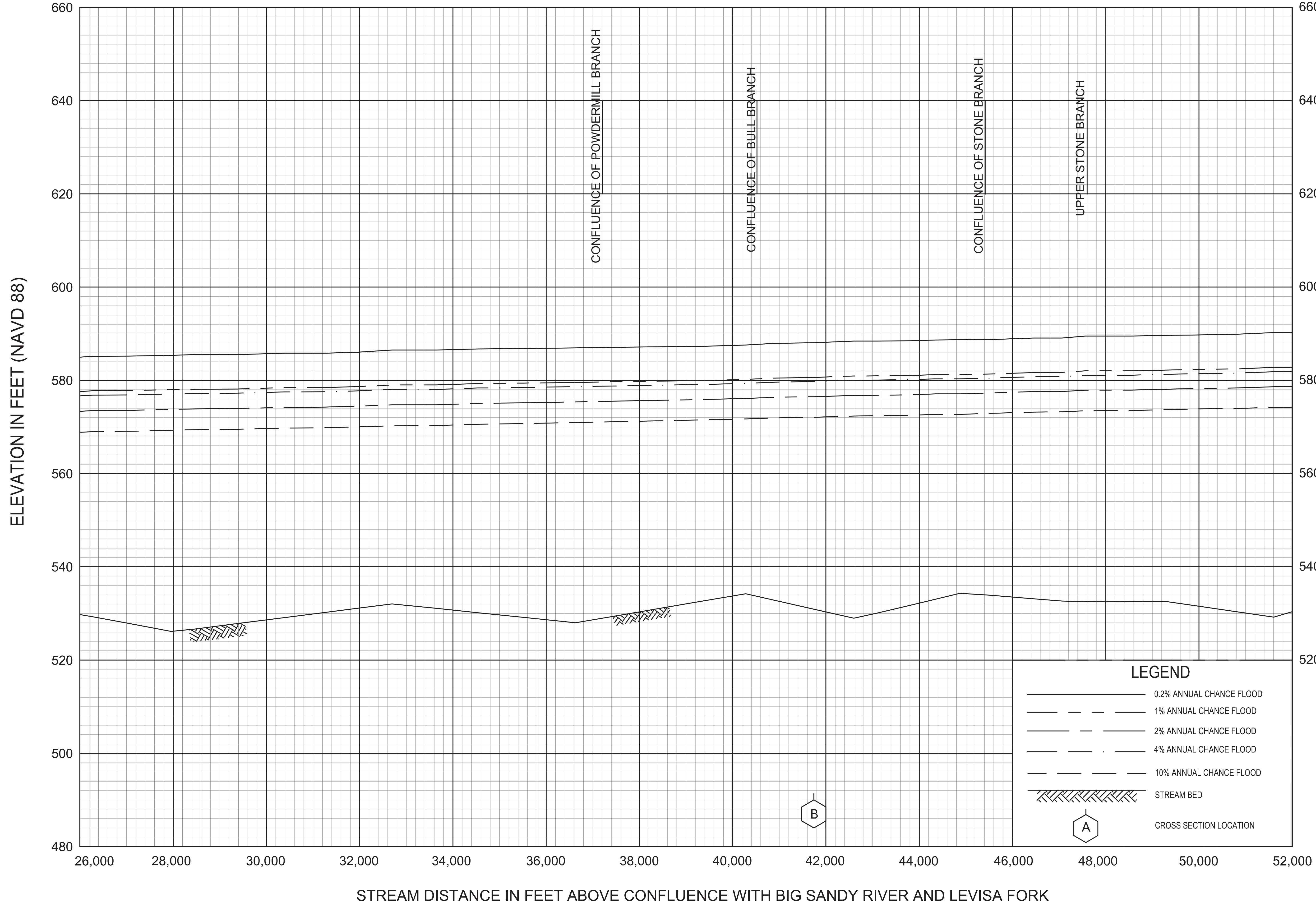
12P



FLOOD PROFILES
TUG FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV AND INCORPORATED AREAS

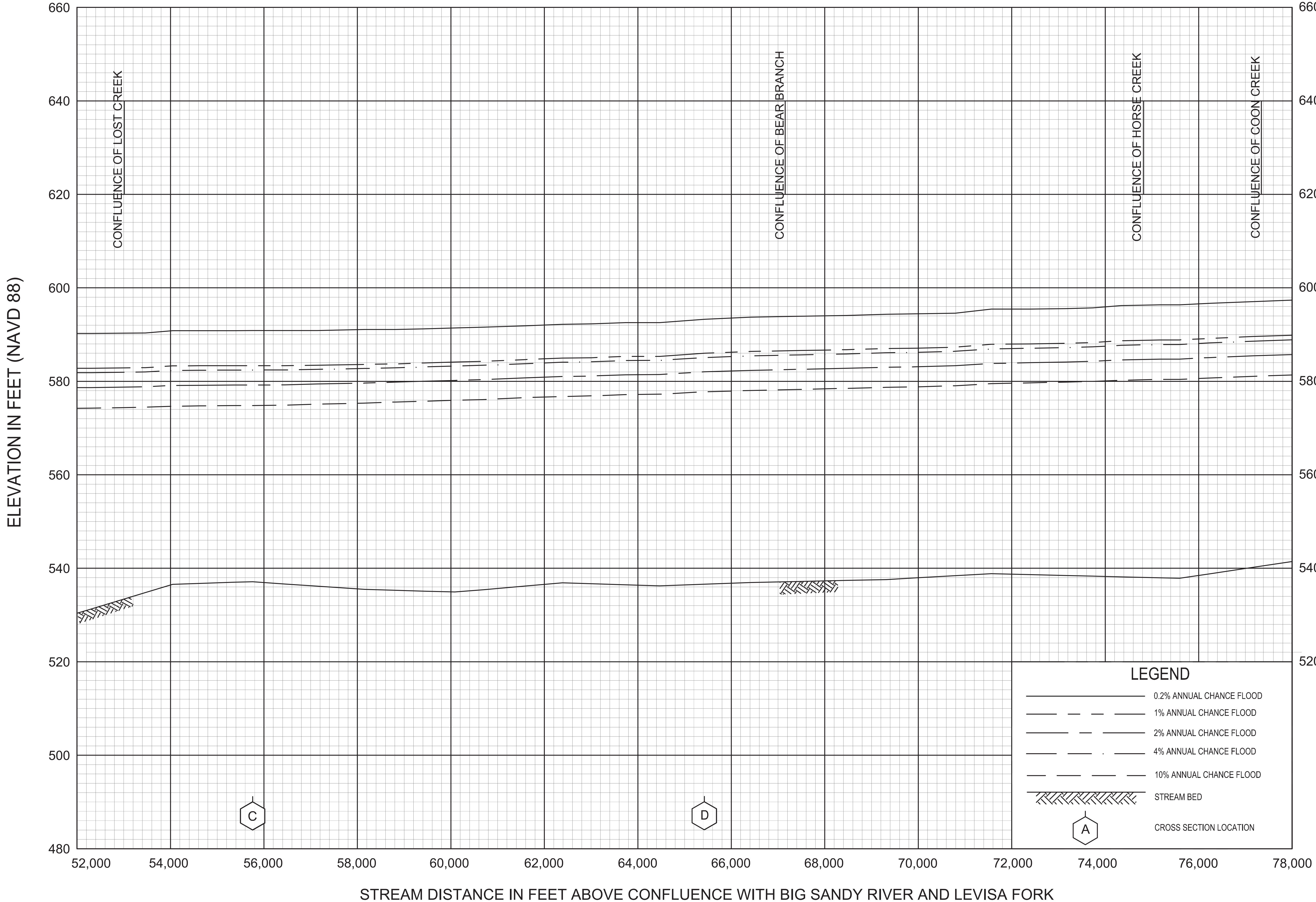


FLOOD PROFILES

TUG FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV
AND INCORPORATED AREAS



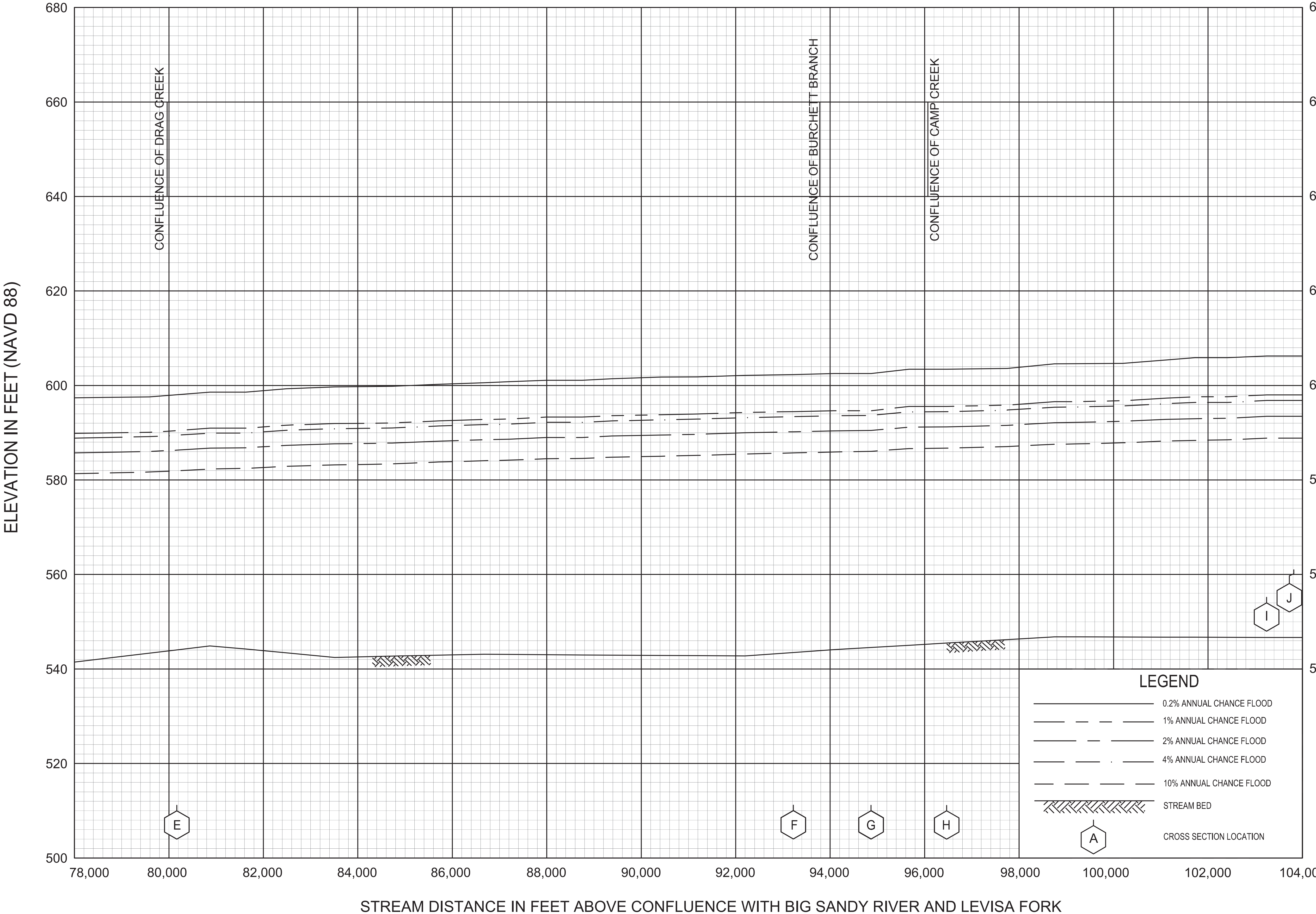
FLOOD PROFILES

TUG FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV
AND INCORPORATED AREAS

16P



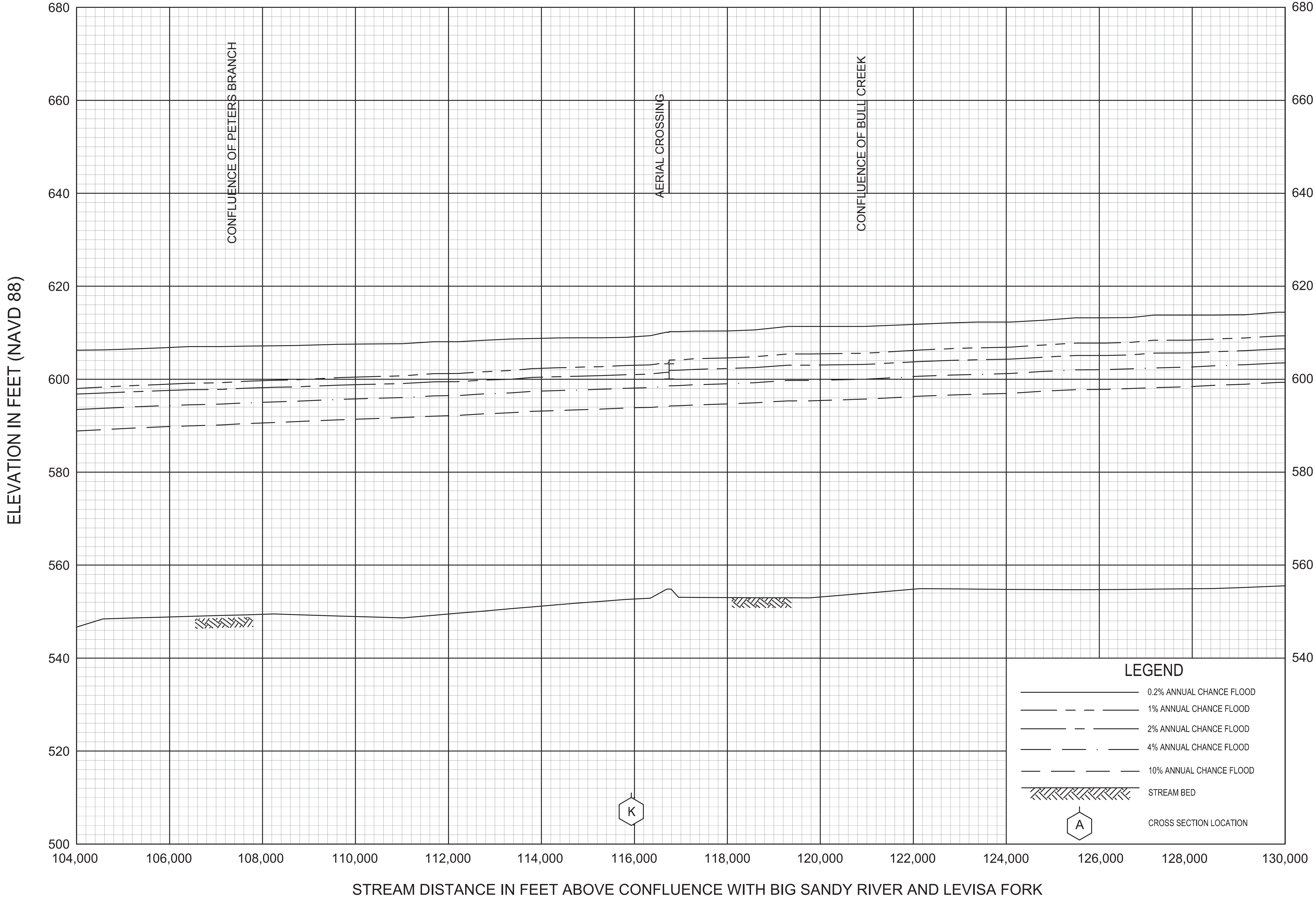
FLOOD PROFILES

TUG FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV
AND INCORPORATED AREAS

17P

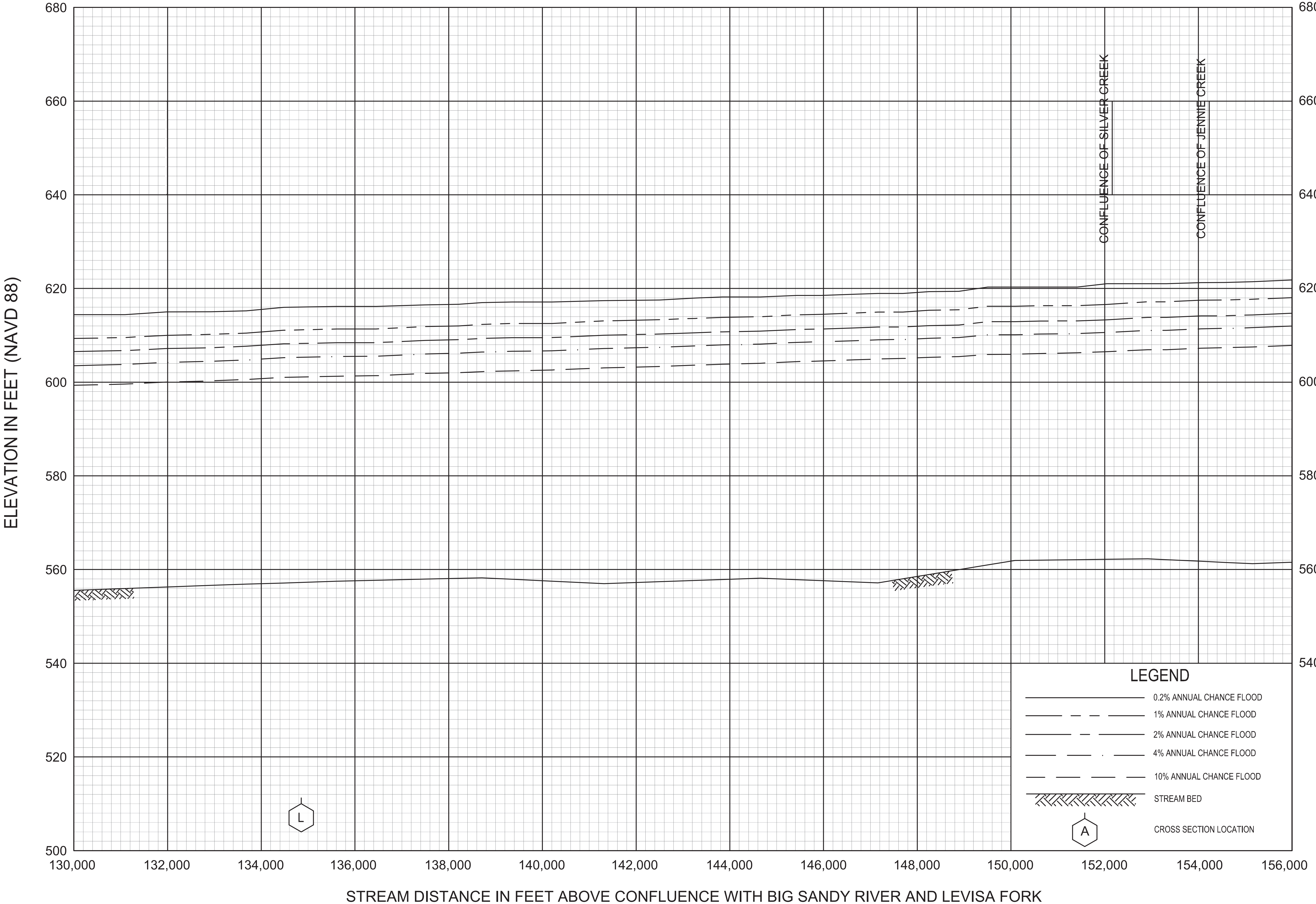


FLOOD PROFILES

TUG FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV
AND INCORPORATED AREAS

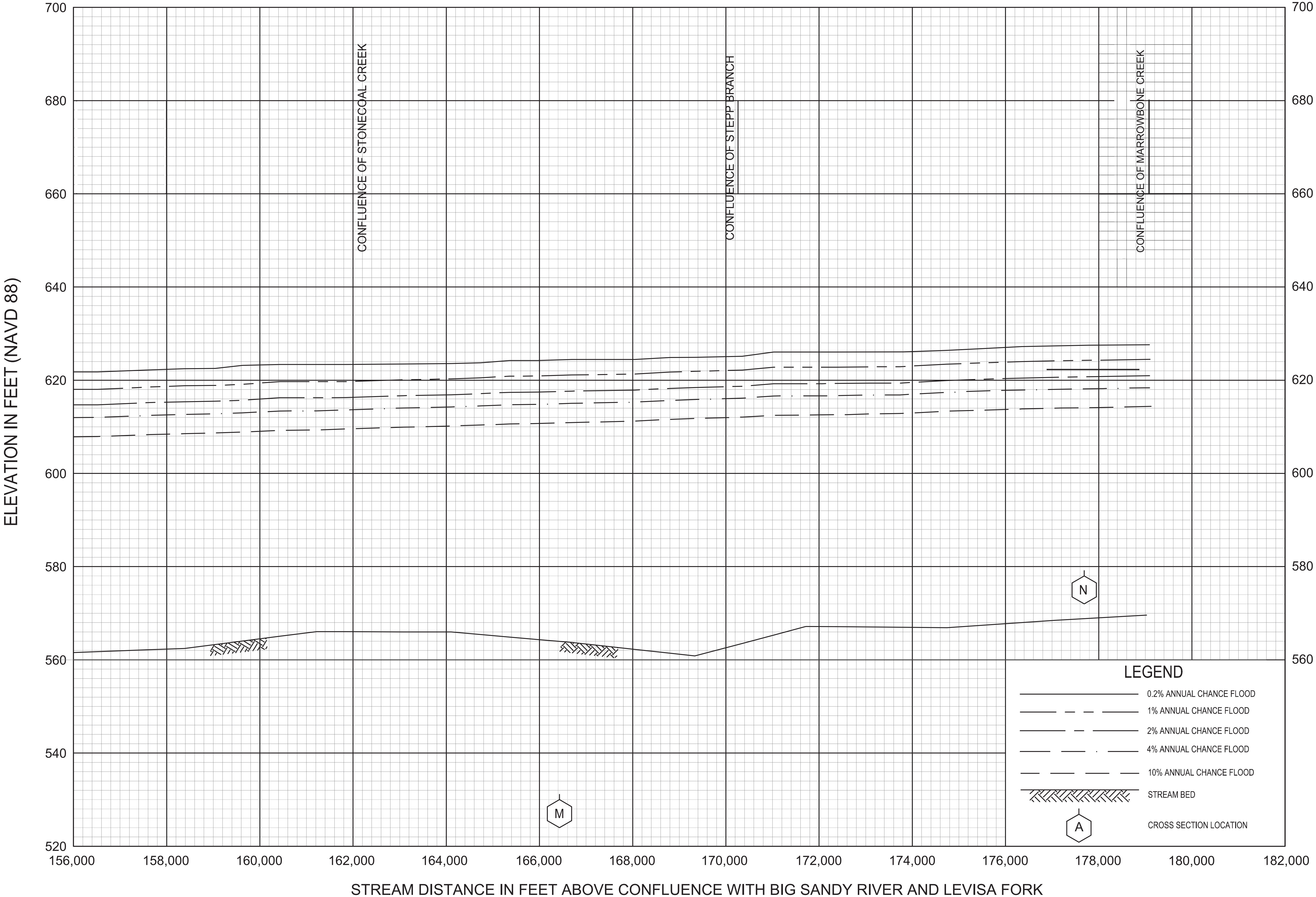


FLOOD PROFILES

TUG FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV AND INCORPORATED AREAS



FLOOD PROFILES

TUG FORK

FEDERAL EMERGENCY MANAGEMENT AGENCY

WAYNE COUNTY, WV
AND INCORPORATED AREAS